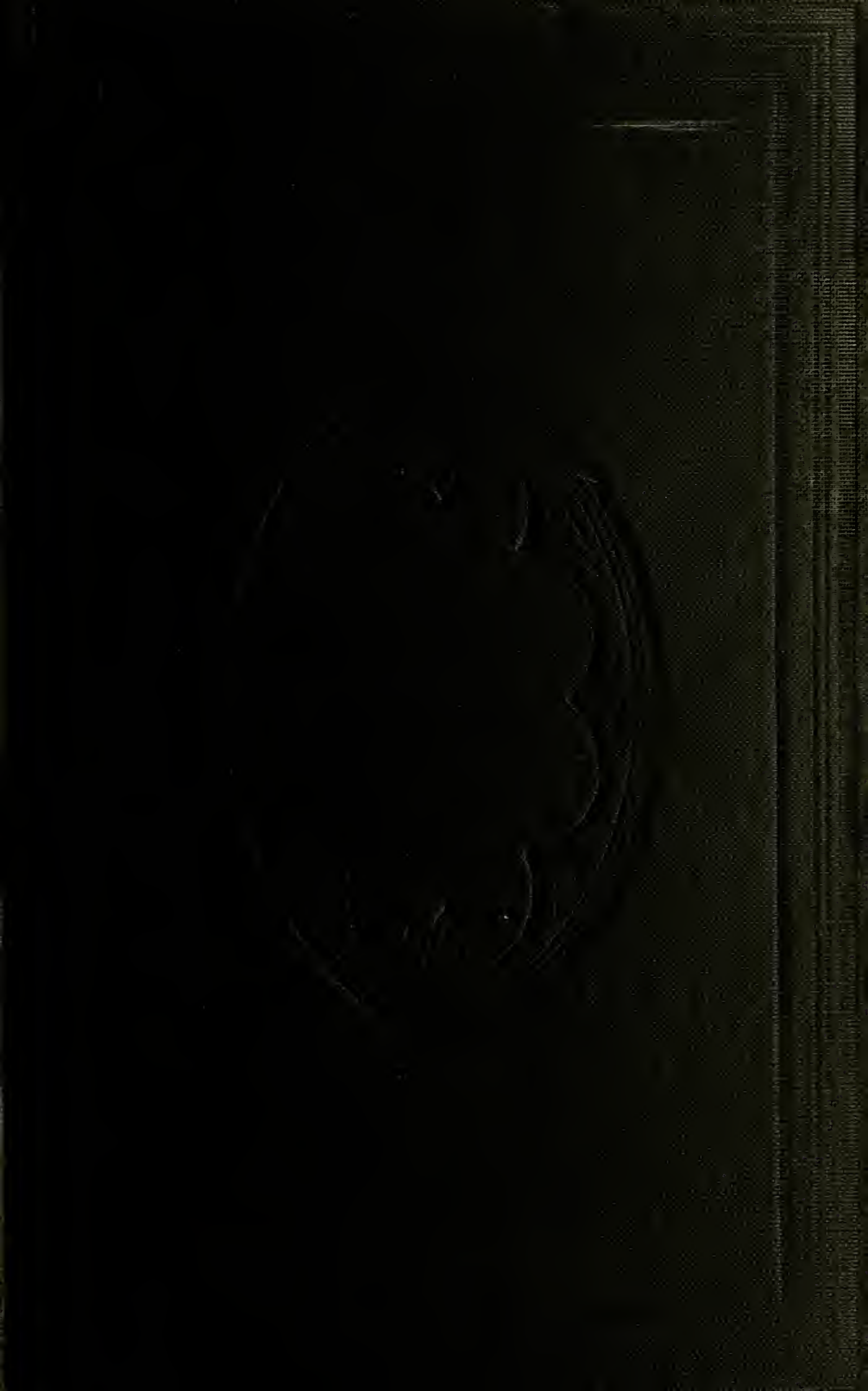


Public Document No. 34

The Commonwealth of Massachusetts

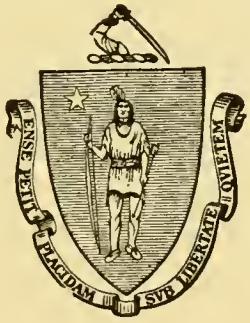
ANNUAL REPORT

OF THE

DEPARTMENT OF PUBLIC HEALTH

FOR THE

YEAR ENDING NOVEMBER 30, 1920



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The Commonwealth of Massachusetts

Department of Public Health,
Boston, Jan. 19, 1921.

To the General Court of Massachusetts.

In accordance with the provisions of section 32 of chapter 30 of the General Laws I have the honor to submit herewith the annual report of the Department of Public Health for the year ending Nov. 30, 1920.

Respectfully,

EUGENE R. KELLEY,
Commissioner of Public Health.

SIXTH ANNUAL REPORT

OF THE

DEPARTMENT OF PUBLIC HEALTH OF MASSACHUSETTS.

For the fiscal year ending Nov. 30, 1920, the Department of Public Health was constituted as follows: —

Commissioner of Public Health, ... EUGENE R. KELLEY, M.D.

PUBLIC HEALTH COUNCIL.

EUGENE R. KELLEY, M.D., *Chairman.*

DAVID L. EDSALL, M.D., 1921.	SYLVESTER E. RYAN, M.D., 1922.
J. E. LAMOUREUX, M.D., 1921.	GEORGE C. WHIPPLE, S.B., 1923.
WARREN C. JEWETT, 1922.	WM. T. SEDGWICK, Ph.D., 1923.

During the year 12 formal meetings of the Council were held, as well as many meetings of the standing and special committees of the Department. The standing committees of the Council for the year were as follows: —

SANITARY ENGINEERING (INCLUDING HOUSING AND RURAL HYGIENE).
Professors Whipple and Sedgwick, Dr. Kelley and Mr. Jewett.

PREVENTIVE MEDICINE AND HYGIENE.
Drs. Edsall, Kelley, Lamoureux and Ryan.

FOOD AND DRUGS.
Professor Sedgwick, Drs. Lamoureux and Ryan and Mr. Jewett.

FINANCE, LAW AND DEMOGRAPHY.
Professor Whipple, Dr. Ryan and Mr. Jewett.

In accordance with section 2 of chapter 792 of the Acts of 1914, at a meeting of the Public Health Council held on Dec. 21, 1920, the Commissioner of Public Health submitted to the Council a report of the Department for the fiscal year 1920, and it was voted that this report be approved and adopted as the report of the Department of Public Health for the fiscal year 1920.

SIXTH ANNUAL REPORT OF THE COMMISSIONER OF PUBLIC HEALTH.

To the Public Health Council.

GENTLEMEN: — In accordance with chapter 792 of the Acts of 1914, I have the honor to present herewith a report of the activities of this Department for the past year, the sixth since the creation of the present Department and the first under the reorganization of the State government, with the change of title from State Department of Health to State Department of Public Health, and with the important added function of administering five institutions, — the four State tuberculosis sanatoria and the Penikese Leper Hospital. Unlike nearly all other departments of the State government, the general reorganization did not affect the form of organization, personnel, functions or fundamental statutes pertaining to the work of the Department save in the matter of the transfer of these institutions.

The activities of the Department have followed the same general lines as in previous years, but the impetus towards the newer fields of health work has been greatly accentuated. Under the term "newer fields of health work" I include such matters as nutrition, oral hygiene, personal hygiene, and public health nursing. In a sense these subjects may be contrasted with the old-established factors in departmental health work, such as sanitary engineering, pure food work, and communicable disease control. These newer branches of sanitary science are in many ways highly specialized, but have one thing in common to a striking degree — they all center upon the individual to a much greater extent than do the older branches of sanitary science. To be effective they must reach the individual and evoke a conscious response. To be most effective they must reach the individual very early in life, by proxy through the parents up to school age and thereafter by directly enlisting the child's active interest and co-operation.

This does not mean that the adult has nothing to learn or to apply for his own benefit from the teaching, for example, of modern nutritional methods — he can learn much. It does mean that unless an intelligent foundation is laid during childhood the resources of preventive medicine must work against a tremendous and in many respects a hopeless handicap when brought to bear upon the problem of the adult. One who has suffered from faulty nutrition as an infant and young child can never quite remove the resulting physical handicaps even by following the most judicious program of diet and physical training in later life.

Unfortunately the day has not yet arrived when the general public or our agencies of government can get a true perspective upon the relation of these newer phases to the whole subject of public health. However, public enlightenment in these matters is rapidly becoming more general, and it is daily becoming more difficult to find qualified expert workers in these fields than it is to find opportunities for them to follow their calling.

In the past decade the conviction has grown upon those who seek to control the ravages of communicable disease that in many instances a sound nutritional and physical developmental foundation in early life is necessary for success in combating infection in later life.

Infant and Child Hygiene.

For several years this Department has called attention in every possible way to the problem of infant and child hygiene. It has encouraged the extension and multiplication of such activities by both public and private agencies. It was responsible for a State-wide survey of infant and child hygiene needs early in the period of the war, made possible by the far-sighted generosity of the Metropolitan Chapter of the Red Cross. Since then it has consistently urged cities and towns to supply the workers needed in each community as shown by the survey.

The Department has gradually increased its own staff of investigators in this field and has conducted educational programs and demonstration clinics to point out to communities their needs in these matters. This last method has been used during the past year, particularly in the western portion of the Commonwealth, and the local response has been most surprising. Every community, large or small, which our workers have visited has been astonished at the amount of malnutrition and correctable defects among its infants and children as revealed by these examination clinics, and many have set in motion some machinery for the perpetuation of such work and for providing facilities to correct the defects uncovered in clinic examinations.

The most far-reaching and ambitious proposals in this direction, however, are those embodied in the various so-called "Maternity Benefit" measures introduced in the Legislature during the past session. The Great and General Court, finding itself unable to arrive at a definite conclusion upon this important subject, referred all such proposed legislation to a special recess commission for study, and provided a sum of money sufficient to carry out fundamental field investigations for the purpose of collecting accurate data upon

the subject for this State. This commission consisted of the Commissioner of Public Health and the Commissioner of Public Welfare, *ex officio*, and three members appointed by the Governor. The personnel of the commission was as follows: Dr. Alfred Worcester, chairman, Dr. Eugene R. Kelley, Mr. Robert W. Kelso, Mr. Edward E. Whiting and Mrs. Helen A. MacDonald. For months the commission met regularly each week under the able leadership of its chairman, Dr. Alfred Worcester of Waltham, who devoted a great deal of time to the investigation. A first-hand study was made of the causes of maternal and infant deaths in this State in the months just preceding the appointment of the commission, together with statistical studies for more remote periods. All data bearing on this problem in other parts of the country and abroad were sought and considered.

As a result of its deliberations the commission reached the conclusion that a system of State-wide extension of public health nursing service offered the most promising results with the least expenditure of public funds, and legislation designed to extend rapidly such service was submitted with a unanimous recommendation from the commission for its adoption.

It is felt that the present loss of maternal and infant life is obviously so much greater than need be, and the life-saving results of such nursing service have been so promptly and uniformly realized wherever they have hitherto been given fair trial, that the people of the Commonwealth through their representatives will authorize this Department to enter upon this phase of public health service on a broad scale in co-operation with the private nursing agencies already in the field.

Mouth hygiene and nutrition problems are closely allied with child hygiene, although these subjects have vast and important applications to later age periods as well. The activities of the Department in these fields have been the subject of most careful thought on my part during the entire year. I wish emphatically to express my conviction that we are falling far short of what we should do in these subjects, but for several years past recommendations looking towards expansion in these fields to an extent more nearly approximating what the Department should be doing have been greatly revised downwards by the authorities controlling finances. This experience has been the more striking because these same authorities have been sympathetic with nearly all other phases of our work. They have said that they could not perceive any widespread popular demand for expansion in these fields, and, while willing to continue the slender staff already employed, have declined to appropriate funds for an

extension of the force. Personally I feel that these subjects are so vital to the well-being of the present and future citizens of the State that an immediate expansion at least threefold is imperatively needed, with every regard for public economy, and I do not see that any one can set limits as to the possible future extension that may be indicated. But, until public opinion on this point is aroused, no one can justly criticize either the executive or legislative branches of the State government for declining to approve this Department's recommendations in this respect. The first and most obvious duty of the Department is to better inform the public of the facts. Once this is done public opinion will shape itself on these subjects, and I know of no subject upon which public opinion is more universally of one mind when once informed. In the summary of the Division of Hygiene the present small activities of the Department in nutrition and mouth hygiene are very briefly sketched.

Personnel Problems.

I wish to refer briefly here to one handicap under which all of our divisions have labored to an even greater extent than last year. I refer to the constant losses among our professional and skilled personnel on account of better remuneration available outside the State service.

A substantial salary increase, averaging from 15 to 20 per cent, was granted to nearly all our staff by action of the legislative and executive departments during the year just closed. This all too long delayed and in many instances still inadequate recognition of faithful service alone saved the work of the Department from utter demoralization and breakdown. Doubtless the same condition held true in many other State departments, but the Department of Public Health is peculiarly a department of technically trained executives and employees, and here is felt and will continue to be felt to an unusual degree the pressure of outside competition. Five professions make up the bulk of our technical staff, — medicine, chemistry, engineering, bacteriology and nursing. The outside pressure of economic competition for trained service in these professions has been so great that I marvel that the Department has been able to retain any of its staffs. I do not think that the facts in this matter are at all known or understood, but if salaries alone had been the determining factor the Department would have lost practically 100 per cent of its staff of physicians, chemists, engineers, bacteriologists and nurses during the past year. As it was, the percentage of turnover was very great, ranging from 33 to 50 per cent in all divisions. Practically all the

members of the staff who have resigned did so to take new positions paying at least 50 per cent more and in several instances the new salary has been double that received in the Department. I refer to this critical situation in some detail because I am not at all satisfied that it is all a matter of the past.

It is true that we have entered upon a period of industrial depression and the demand for unskilled and certain technical services is much slackened. On the other hand, the cost of living and the purchasing power of the dollar generally have not yet materially changed. Furthermore, because of a combination of lessened output of graduates from the technical schools during the war, or, as in the case of physicians, for a long period before the war, and the great increase in the opportunities for such graduates in industry and other outside public service there exists to-day a partial vacuum, so to speak, in regard to these professions. This manifests itself in a constant economic pressure operating in the form of a higher wage opportunity to draw these classes of trained specialists out of State and municipal service.

The Plague Problems.

The plague has been a scourge of mankind from remotest ages. Originally the term was used in a loose sense to designate any severe epidemic, but for several centuries now it has been confined in a medical sense to the bubonic plague. This disease has had a curious and as yet unexplained tendency to sweep over all the world where commercial intercommunication exists at irregular periods, generally some centuries apart. In the intervals plague persists in certain fairly well-defined spots in Asia and from time to time breaks forth from these foci in epidemics of great severity.

In the fourteenth century a terrible outbreak of plague occurred in Europe for over the period of a generation and according to the estimates resulted in the death of at least one-quarter of the population. Minor epidemics followed this great outburst. The best known of these, though really representing a diminishing phase of the outbreak, was the great plague of London, immortalized by Defoe in his noted work. From this time on plague tended to recede from Europe of its own accord. It never was a factor in the Western Hemisphere until the present pandemic. Commencing in one of the well-known permanent homes of the disease in China near the borders of Thibet in 1894, plague again began a world-wide sweep. That the disease under conditions favorable to it has lost none of its ancient malignancy may be judged from the fact that for over

ten years, consecutively from 1904 to 1914, deaths from plague in India alone averaged nearly a million each year.

Meanwhile modern sanitary science has discovered the method of transmission and has found that plague is essentially a disease of rats and only spreads to man where man lives in close association with rats. Moreover, it has been demonstrated that it is possible by definite measures directed against the rat to minimize the probability of the spread of infection and to eradicate it if found in seaports before it becomes sufficiently extensive in rats to be a serious human menace.

Plague first manifested itself in this country in San Francisco nearly twenty years ago. After a period extending over several years in which the local commercial interests, medical authorities, political agencies and press all joined in a remarkable campaign of denial, cases of this disease, following the great disaster of 1906, assumed a degree of frequency and deadliness where evasion or denial were no longer possible. Then, by a remarkable campaign conducted by Federal, State and city health authorities, with all the civic bodies of State and city actively co-operating, the disease was completely eradicated from San Francisco within three years.

In 1914 the port of New Orleans became infected. After an apparently successful campaign of eradication plague again appeared in that city in November, 1919. This resulted in a much more thorough rat eradication program being put into force with apparently prompt success. But this summer numerous human cases appeared suddenly in three other seaports, — Galveston and Beaumont, Texas, and Pensacola, Fla. Systematic rat catching and laboratory examination of rat corpses revealed extensive rat plague in all these cities. The control methods promptly put into effect have resulted in apparent control of the situation in each city.

At the same time alarming though obscure reports have come of plague being present and more or less concealed in many places in Europe.

As a result, it seems only the part of common prudence to make a careful investigation into the condition of the rat population of all the seaports of this State. This is already being done on a more or less thorough scale in practically all ports south of and including New York City. New England has not so large a total tonnage as other sections of the country, but in the aggregate number of ports, any one of which may serve as a point of infection, this section has an astonishingly large percentage of the ports of the entire country, and Massachusetts itself has by far the largest number of ports in

New England. The city of Boston has already taken steps to examine into the condition of its rat population.

The port of Boston is a complex affair. Ten or more separate cities and towns border upon it. Several other ports are in close proximity to Boston. In all of these places a careful survey should be made of water-front conditions and of the rat population. For instance, if a smaller city bordering or near-by Boston becomes infected, the efforts of the Boston authorities will be largely neutralized. For this reason and because of the obvious saving in "overhead" in having a scientific inquiry of this sort done in one or two laboratories rather than expecting each small municipality to do its own investigation independently, I have considered it the plain duty of the Department, as a protection both to the public health and our commercial interests, to recommend to the General Court to appropriate during the special session a sum of money sufficient for the Department to take the lead, and, supplemented by the efforts of the municipalities and towns directly threatened with the possibility of the invasion of plague, to carry through a general rat survey and rodent laboratory examination in all seaports carrying on interstate and foreign commerce. The organization that can best give the definite direction and concentration of laboratory material required for this work and at the same time guarantee an adequate type of laboratory work is the Department of Public Health. A unified State-wide effort, applied to all ports, regardless of size, presents the only effective method of attacking this question.

Tuberculosis and Leprosy.

The activities of the new Division of Tuberculosis are summarized later in this report, and the detailed account of the entire work of the Division, including that of the sanatoria, is printed in the general report of the Department.

The subject is so important that I wish to refer briefly to it here largely by way of emphasis.

Last year I touched upon the proposed new organization. This has been attained by the transfer to the Division of Tuberculosis of all tuberculosis activities formerly carried as a part of the work of the Division of Communicable Diseases.

The year has been signalized by a veritable new access of enthusiasm and interest in the tuberculosis problem. I feel it is no reflection upon the splendid work of the voluntary tuberculosis societies in the past to state that never have the relations between such bodies and this Department and local boards and departments of health been as

mutually helpful as during the past year. All that I predicted in my last report has been realized and more. The establishment of consultation clinics for large cities and special examination clinics for the smaller cities and towns is in my judgment the most promising development in years in pointing the way towards the long-held ideal of having in the sanatoria only early and favorable cases of the disease. There should be collected enough men, women and children in the early stage of tuberculosis to keep the four State sanatoria filled and still furnish a large group of this type for the county and municipal institutions.

To properly develop the consultation plan will probably require a considerable enlargement of the sanatoria medical staff. I do not recommend such an enlargement this year because the experiment is still in its incipiency. But if the response of the medical profession, local health departments, school and tuberculosis workers to the generous offer of the sanatoria staffs to take the time, in spite of the already crowded routine, to examine suspicious cases in their own localities in consultation with patients' own physicians continues as it has begun, some addition to the staffs of the sanatoria will become a necessity. And if the extension of such consultation service brings about only a 10 to 15 per cent increase in the number of persons showing truly "incipient" or "favorable early" types of consumption seeking admission to our sanatoria, the resulting economic saving in the reduction of average period of treatment will be sufficiently large to many times outweigh the additional expense of an increased medical staff.

The management of the sanatoria during the past year has been extremely difficult because of labor scarcity, failure in deliveries of coal and other necessities, and particularly because of the inability of the sanatoria to compete with industrial establishments and with other institutions having a more elastic wage scale. So paralyzing has been the effect of this labor shortage that it has been necessary on occasions for a superintendent of a sanatorium to "fill in" in all sorts of domestic service positions, even to waiting on table. That such a situation has meant straining the mechanism of the institutions to the point of absolute breakdown is self-evident. That, on the whole, a high grade of medical and nursing care and dietary and domestic service have been maintained throughout the year speaks volumes for the loyalty and patience of the superintendents and the group of loyal officers and employees who refused to leave their posts under the constant pressure of offers of higher pay from outside sources.

These institutional conditions all hold true to even a greater degree

in the problem of the administration of the leper hospital at Penikese. Seldom has a State received the benefit of unselfish devotion to duty under such peculiarly trying circumstances as these which have characterized the services rendered by the Superintendent of this institution and his wife over a long period of years and particularly during the hard year just passed.

Isolated on a small barren island, cut off from professional and social associations alike, ministering to the needs of those most to be pitied of mankind, for years he has given the benefit of a highly trained scientific mind and real human sympathy to his charges. It is only fitting that as a climax he should have succeeded in producing the first practical arrests in the United States of the formerly hopeless disease of leprosy.

Five years ago the Federal government passed legislation providing for a national hospital for lepers and relieving States, counties and cities of further burdens in the care of such cases. During the period of the war it seemed to be impossible to settle the question of a site and suitable buildings. At present the United States Public Health Service has consummated a bargain with the State of Louisiana whereby the State has turned over to the Federal government its leper hospital. Certain enlargements and alterations are planned and in the near future the entire problem of provision for the care of the relatively few lepers in Massachusetts will be assumed by the Federal authorities.

Special Water Supply Investigation.

In accordance with the direction of the Legislature this Department and the Metropolitan District Commission have maintained a considerable engineering force in the field, carried out extensive office compilations and studies, and extensive geological and meteorological field studies. A certain amount of laboratory experimental work has been done bearing upon the pressing problem of the extension in the near future of the water supplies of Massachusetts, particularly in the eastern part of the State.

The continuance of the period of excess rainfall now running over nearly a decade has been most fortunate for Massachusetts. It is this circumstance alone that has prevented an actual failure of the water supplies of many of our cities and towns.

The always great difficulties of conducting an engineering investigation of such magnitude have been greatly increased by the unprecedented weather conditions of the past winter, which put a complete stop to all engineering work in the field for months, and

because of the universal shortage of technical services. Nevertheless, the investigation is making satisfactory progress, and by the end of another year, if not sooner, the Joint Board will complete its studies and submit to the Legislature plans for the solution of this problem, which though at present little appreciated by the general public is one of the most serious questions of public concern that this generation of Massachusetts citizens must solve.

Disease Prevalence.

In the matter of disease prevalence the past year has been noteworthy in two respects: (1) a recurrence of influenza in epidemic form and (2) a very considerable epidemic of infantile paralysis. Fortunately, both of these were much less severe than the last preceding epidemics of these diseases.

Influenza began to exhibit epidemic proportions in January and continued until late in March, when it subsided rather rapidly to normal proportions. The epidemic was mild only in a relative sense. If the terrific influenza fatality of 1918 had never occurred, this epidemic would have been considered by health officers and the general public alike as an almost unprecedented disaster. In all, 1,660 deaths and about 35,000 cases were reported.

Poliomyelitis began to be reported to an unusual degree in July, became most serious about October 1, and then steadily declined until it practically reached normal frequency about December 1. In contradistinction to the great outbreak of 1916 this outbreak was quite sharply localized. At that time practically all sections of the State were affected, while this year nearly all the cases were in the eastern half of the State, the great majority being in the immediate vicinity of Boston with the exception of a distinct additional zone of relatively heavy infection extending down the Merrimack River valley. Although this was one of the heaviest visitations of the disease on record, there being almost exactly one-third as many cases and deaths as during the great epidemic of the disease in 1916 (689 in 1920, 1,920 in 1916), and although this Department gave out the facts of prevalence as cases were reported day by day, the outbreak produced no public alarm whatever.

It is difficult to state just why such a complete reversal of sentiment occurred. The war and the influenza epidemic have perhaps accustomed our people to death in the mass to such an extent that the public poise is not shaken by occurrences that a few years ago would have produced almost a public hysteria.

Aside from poliomyelitis and influenza the Commonwealth has

again been free from serious epidemics. Scarlet fever has been more prevalent than has been the case for several years, but the relative mortality has been low and the total of deaths, though more than the yearly record of the three immediate preceding years of remarkably low mortality, is not above the average for the past ten years and is far below the average of a generation ago.

Diphtheria shows about the same mortality as for the past two years. There have been no extensive outbreaks of this disease, but its non-epidemic occurrence has been above the average. The means for the prevention and cure of diphtheria are now so well-known that I feel very keenly the continuance of this unnecessary mortality in children, and I believe the Department must make an extraordinary effort during the next few years to reduce the residual diphtheria mortality to negligible proportions.

In my last report I dwelt in some detail upon the steadily declining typhoid rate. This fortunate condition has continued and our record for this year is a little better than ever before. For the first time in the history of the Commonwealth, at least since dependable statistics have been available, the total typhoid deaths for the year are less than 100, and this with a steadily increasing population. This sustained record of less deaths practically every year for the past eight consecutive years, culminating in a new low death rate record for typhoid, is something to which every citizen of the State can point with pride. This achievement represents the fruits of the intelligent application on a wide scale of the accumulated public health science and experience of the past fifty years, and points the way to the possibilities for a more complete control of other communicable diseases.

Even more impressive and satisfactory to every health worker is the continuance of the decline in mortality from tuberculosis. The surprising drop in mortality for this disease which I commented on in 1919 has continued throughout the present year. In all, approximately 500 less deaths have been recorded during 1920 than during 1919. This establishes a new low death rate for tuberculosis for this Commonwealth, — the rate being approximately 100 deaths per 100,000 population, — last year's rate being 105.8, and both years being substantially below the previous low record of 1913, which was 113 deaths per 100,000. These figures are particularly remarkable when it is considered that Massachusetts has one of the most difficult types of population with which to show satisfactory results in tuberculosis work that could well be imagined.

As I observed last year, there is no justification for assuming that anti-tuberculosis activities, State, county or city, public or private,

are responsible for all or even the greatest portion of this showing. Experience teaches that fluctuations must be expected in the mortality from this disease in the future. Nevertheless, I can see no logic in the captious criticisms of a pessimistic school of writers who have come to the front of recent years, and, often approaching the subject from a background of theory with little or no first-hand knowledge of the disease, have charged that all declines in tuberculosis mortality have been purely accidental and especially that institutional treatment of the disease has produced no results.

Massachusetts has put into effect one of the finest and most complete institutional programs for consumption in existence. This State is also developing better facilities for early diagnosis and extending the machinery for better informing and convincing the public of the wisdom of early examination in suspected cases of tuberculosis and early treatment. All of these things are being done and coincidentally we are obtaining some of the best results in tuberculosis work that can be found the world over. As long as such results can be shown I believe it is the wisest as well as the most humane policy to continue steadily along the present lines while constantly on the alert to discover and adopt other better means of combating this dread disease, but not to be stampeded under any circumstances into abandoning any of the methods that have been thoroughly tried out for tuberculosis control and which have stood the test by the only standard for proving values — results.

Venereal Disease.

The present program against venereal disease has now had nearly three years of trial. It has been supported by a combination of State and Federal funds. Federal funds have been voted for the last three years by Congress for the furtherance of such work and these funds have been allotted equitably to all States whose individual appropriations for venereal disease work equalled or exceeded the Federal allotment. In turn, States have generally passed on funds to individual communities to assist them in the establishing of clinics for the treatment of these diseases and in other ways. This Commonwealth led the way for venereal disease control measures by preparing and distributing freely to qualified institutions and physicians arsphenamine, so essential in the treatment of syphilis. Twenty such clinics have been assisted, and in all but five instances these clinics have been originated directly as a result of this program.

Like all new movements it is only fair to say that our venereal

disease program has had its ups and downs. We have tried out thoroughly and carefully proposals for better education of the public along these lines.

The policy of the Department has always been distinctly conservative on the educational side of this question and therefore has received criticism from certain sources representing the impatient radical element in venereal disease and social hygiene work who of late years have been urging a universal campaign of publicity without stint to reach the entire population in the mass. This Department has steadily disapproved lectures on these subjects to mixed age groups, and cleverly exploited moving-picture productions touching upon subjects of sex and the dangers of venereal infection. I believe time has increasingly justified this conservative stand. Experience has shown that a large element of morbid curiosity enters into the drawing power of the public lecture on sex topics, that a hope of viewing the salacious rather than of absorbing useful hygienic and moral lessons fills the "movie" when the sex motif is presented on the screen, and that some of the points so forcibly driven home by a sane lecturer may have precisely the opposite of the intended result upon the immature minds of their auditors. But within what the Department considers suitable channels an educational campaign in these matters, which cannot fail to be productive of good results, has been quietly and persistently carried on.

Our handling of the subject as a public health problem has proved thoroughly sound and practical in its development. A co-operative project carried out with the State Probation Commission, perhaps unique in this country, has been the special work to thoroughly inform court and probation officers of the applications of the venereal disease treatment and diagnosis facilities to their routine work.

Public Health Nursing.

It is a matter of deep personal regret that I cannot report better progress in this most important field of public health activity. In the Commonwealth, as a whole, public health nursing has progressed during the past year in splendid fashion. But in our own organization we have been forced to lose the services of many of our staff of public health nurses because of the much more attractive and adequate salaries offered on the outside from all manner of sources for their services in work of most important public health nursing character.

I am thoroughly convinced that the Department must have a fully organized division of public health nursing with adequate supervising staff working under an efficient director before we can measure up to

our possibilities of leadership in this great field that is urgently desired by every one in the State interested in or engaged in public health nursing. Nor can the full possibilities of life saving and health promoting by the adequate development of public health nursing service be realized until the proper correlation of public health nursing activities throughout the Commonwealth, as such a division can best furnish, is an accomplished fact.

The Public Health Council of the Department realizing the great importance of this matter voted some months ago to establish such a Division and to take advantage of the nation-wide co-operative policy of the American Red Cross to make the Department's director of the Division of Public Health Nursing, when established, also the State supervisor of all nurses employed by the Red Cross. This policy was decided upon in order to avoid any duplication or friction between the public health nursing policies and personnel of the cities and towns and those directly put into the field by the Red Cross.

Unfortunately under the present scheme of administrative organization of the State government, it is not possible to make a proposed new division a reality until maintenance for it is provided in the annual budget.

The budget authorities declined to approve the admission of such a proposal until the question of maternity benefits shall have been passed upon by the Legislature, and hence the problem of creating a separate Division of Public Health Nursing must remain in a state of suspended animation for the present, while the subdivision of public health nursing of the Division of Hygiene has been reduced to practically a paper organization for the reasons just explained.

The Continuing Laboratory Problem of the Department.

This subject was dealt with in last year's report and it was pointed out then how serious this matter has become. An estimate for the erection of a laboratory plant was submitted, but on account of excessive construction costs, the State Supervisor of Administration declined to recommend to the General Court that the erection of such a new building be authorized. The Department has continued to occupy on sufferance its old quarters for the Biologic Laboratories at Forest Hills and for the Wassermann Laboratory in the Harvard Medical School buildings and under protest from Harvard University, which owns the property and desires its use for university purposes. The Department has of necessity negotiated a short-term lease for a small building well adapted for the purpose for the use of the laboratory unit manufacturing the remedy for syphilis, — arsphenamine.

The pressing question of laboratory facilities for this Department is yet to be settled.

In this connection I wish to call to your particular attention the summary submitted by the new director of the Division of Biologic Laboratories in reviewing the work of the first nine months of his administration. Never has the policy of obtaining full-time service at the head of each important branch of the Department's activities been more strikingly confirmed than by the public health and financial results of his short administration. Of even greater importance for the future is the fact that this Division is beginning to bring its true life-saving significance and possibilities adequately before the medical profession, health authorities and institutional and school authorities of the Commonwealth generally.

The Plumbing Report.

Last year the Legislature took cognizance of the practical and scientific value of the report of the Special Plumbing Board, which had been appointed on the initiative of the Department to study the possibilities of simplification of plumbing regulations and the resulting economies in plumbing installations and better protection of the public against fraud or incompetence by authorizing by special resolve the publication of the report as a legislative document. The Legislature further directed the Department to continue such studies and to submit legislation designed to make plumbing procedure more uniform and less burdensome financially.

In spite of the fact that no funds were provided to carry on necessary public hearings on this matter in different sections of the Commonwealth, as I recommended last year, the Board has continued its work, has held four hearings at the State House, and has tried to gain a comprehensive grasp of the problem as it affects the entire State by correspondence and by conferences in Boston with representatives of a number of organizations and official agencies interested in the subject. As a result, the Board has drafted legislation, which has been approved by the Public Health Council and which, I believe, will, if enacted, operate greatly to the benefit of the public and help in a minor way to solve the housing problem. Incidentally, by increasing the volume of business it will, I believe, be of benefit to persons connected with the plumbing business. I hope that the General Court will enact legislation which will make it possible to incorporate the fundamental principles embodied in the published report of the Special Plumbing Board in a new plumbing code, which, while providing minimum requirements State-wide in their application, leaves their enforcement, as well as the adoption of regulations beyond the minimum requirements, to the local authorities.

Legislative Recommendations.

The following recommendations for legislation have been submitted to the General Court: —

1. A resolve authorizing the Department of Public Health to provide for the prevention and control of bubonic plague. (Submitted to the special session of the Legislature.)
2. An act authorizing the exchange or sale of surplus stock of biologic products manufactured by the Division of Biologic Laboratories.
3. An act to provide for clean, sanitary and healthful food establishments.
4. An act exempting certain employees of the Department of Public Health from civil service law and the rules and regulations made thereunder.
5. An act to regulate the manufacture of certain carbonated beverages and soft drinks.

Division of Administration.

There have been but few changes in the Division of Administration during the past year. In accordance with the terms of chapter 350 of the Acts of 1920 all purchases of office equipment, supplies and furniture by individual departments must be made through the Superintendent of Buildings. As might have been expected such a radical change as this was the cause of some delay and dissatisfaction, but a system has now been devised and is working smoothly between this Department and the office of the Superintendent of Buildings.

The transfer of the four State sanatoria and their administration unit to this Department has meant a slight increase in the work of this Division. However, as all of the detail bookkeeping for each institution is handled by the institution itself this increased work is materially less than would otherwise be the case.

All personnel matters are now handled through the office of the Supervisor of Administration via the Division of Administration of this Department. This is true in all cases except for certain classes of employees at the State sanatoria, where the employment of a certain quota of employees of various groups is allowed, and as long as this quota is not exceeded individual requisitions upon the Supervisor's office are not required.

With the coming of the new year it is planned to transfer the library and the librarian from this Division to the Division of Hygiene. The latter Division has charge of all publications and other printed matter issued by the Department and therefore the Division of Hygiene would seem a more logical place for the library than the Division of Administration.

Division of Sanitary Engineering.

The total number of formal applications received from municipalities and others for advice with reference to water supply, drainage, sewerage and other subjects presented for the consideration of this Division during the year ending Nov. 30, 1920, was 141, or about the same as in the year 1919.

The abnormally high prices of both material and labor, together with unfavorable financial conditions which have especially marked the larger part of the year 1920, have caused a further postponement of much necessary municipal work, including the construction, extension or enlargement of many water supply and sewerage systems already too long postponed on account of the recent World War. The fact that this postponement of the construction of necessary works has been followed as yet by no very serious consequences is to be attributed to the high rainfall which has prevailed for a period of several years. The flow of streams in the fall of 1919 was unusually large and the rainfall for the first six months of 1920 was probably the greatest that has occurred in the State in that period since 1870. This high rainfall, completely filling the reservoirs and thoroughly saturating the ground, has resulted in the highest average flow of rivers, judging from that of the Nashua River, in a period of twenty-four years. While there was a considerable deficiency in rainfall in parts of the State during some of the months from July to October, inclusive, the flow of streams, judging from the flow of the Nashua River, was above the normal in all but two months throughout the drier part of the year. These conditions have contributed considerably to the length of water supplies in many of the cities and towns where the consumption of water has increased greatly, in some cases nearly 50 per cent, since the last very dry year nine years ago, and the use of water in some of the cities and towns is in excess of the safe capacity of their sources of water supply. Furthermore, the excessive rainfall and flow of streams has had a tendency to keep them cleaner than usual, supplying an unusual amount of clean water for the dilution of sewage and other objectionable matters which they receive. There is no question that the use, or rather abuse, of the rivers of the State if continued — using them for the removal of quantities of foul matter in excess of their capacities for effective dilution — will result when the next series of dry years occurs in great nuisances in a number of streams. Relief from such nuisances cannot be afforded promptly, two years or more often being required, including the necessary preliminary steps, for the construction of

proper sanitary works, and the only practicable method of guarding against the evil effects of such nuisances is to provide the necessary works in sufficient season to make them available when required.

In addition to the regular work of the Division, certain special duties were referred to it as the result of legislative proceedings during 1920. These are —

To make reasonable orders limiting and regulating the entrance or discharge into the Charles River of polluting matter injurious to the public health. (Chapter 541, Acts of 1920.)

Report relative to the sanitary condition of the Acushnet River and certain streams tributary and adjacent thereto. (Chapter 32, Resolves of 1920.)

Much work has been done by this Division in the investigation of special benefits accruing to land in the neighborhood of the Neponset River, effected by improvement in the channel of that stream, in order to facilitate a decision of the questions involved by the committee of the Department having this matter in charge. While this work has not been very extensive, it has required considerable thought and much planning.

The special investigation of the water supply needs and resources of the Commonwealth, authorized by the Legislature of 1919, by the Joint Board consisting of the Public Health Council and the Metropolitan District Commission has been prosecuted as rapidly as practicable during the year.

One of the notable accomplishments of the year, made possible by the return of men called away by the war and the consequent increase in the office force, has been the compilation and classification of the data which this Division collects regularly from year to year as a part of its routine work as required by law. This work, which for the past few years has been necessarily postponed to as great an extent as possible, is now being brought up to date. These activities are fundamental and essential as a basis of sound conclusions and adequate advice concerning the major problems of water supply, sewerage and sanitation submitted for the advice of the Department.

Division of Water and Sewage Laboratories.

The Division of Water and Sewage Laboratories has been engaged during 1920 in carrying out its usual activities. These are divided between analytical work and research. During the year 6,343 chemical, 1,887 bacterial and 1,920 microscopical examinations were made. These analyses were made to ascertain the condition during the year of the rivers, wells, public water supplies and ice supplies of the State;

of the efficiency of sewage filtration areas; for determining the character of trade wastes and for the furtherance of studies regarding their disposal; and for determining the condition as regards bacterial pollution of shellfish from different sources. Besides this a large amount of analytical work has been done for the new Commission upon Water Supply Needs and Resources of the State. Research has been carried on in regard to the corrosion of pipes in many cities and towns of the State and at the experiment station; many studies have been made upon methods for the disposal of trade wastes; upon important modifications of the activated sludge tank process of sewage disposal; upon seasonal and other variations in the bacterial quality of shellfish from different areas of the State; of the relative significance of *B. coli* and *B. aerogenes* in bacterial water examinations and methods for the differentiation of these two species; in regard to the efficiency in water treatment of liquid chlorine at low temperatures; and of the effect of certain wastes upon municipal filtration areas. Many experimental water and sewage filters, septic tanks, etc., are in operation at the various stations for various purposes.

One of the interesting and exceedingly important and promising lines of research carried on there during the past three years has been in regard to the removal of color from water by the precipitation of the usual color removing chemicals in the sand of filters instead of by the direct application of such chemicals to the water undergoing filtration as is universal in the so-called mechanical filtration of water. By this method of color removal the chemicals are used over and over again, thus reducing the cost of such water treatment very materially. In fact, the longer such filters continue in operation the smaller grows the cost per million gallons of water treated owing to the continual reuse of the chemicals. Among other advantages of the method are the absence of carbonic acid in the filter effluents, thus lessening the danger of corrosion common with mechanical filter effluents and the absolute prevention of acid effluents due to the passage through the filters of undecomposed aluminum sulphate.

Division of Communicable Diseases.

With the exception of an outbreak of influenza in January, February and March and of anterior poliomyelitis during the late summer months there have been no outbreaks of any great magnitude.

During the influenza outbreak from January 1 to March 31 there were 35,633 cases and 1,660 deaths, giving an apparent fatality rate of 4.65 per cent. There have been roughly 1,000 additional cases for the remainder of this year, with 9 deaths.

The total number of cases of all reportable diseases for the year was 135,242.

The diseases showing a noticeable increase over 1919 are chicken pox, measles, lobar pneumonia, scarlet fever and whooping cough. These five diseases give an excess of approximately 31,000 reported cases with reports of measles markedly predominating.

Anterior poliomyelitis showed an undue incidence about the 1st of July. This continued to increase up to about the week ending October 2 when the peak was reached, and since that date the cases have decreased. That the preparalytic diagnosis of anterior poliomyelitis through lumbar puncture and immediate determination of cellular content of the spinal fluids might be available to the physicians of the State, the Department, co-operating with the Harvard Infantile Paralysis Commission, appointed two physicians especially trained in this work. Fifty-seven cases were visited and classified by them as follows: —

	Cases.	Puncture.
Late paralytic,	8	–
Early paralytic,	15	8
Preparalytic,	10	10
Not poliomyelitis,	22	8
Not diagnosed,	2	2

The number of cases is of course too limited to draw conclusions. However, of the 10 cases diagnosed by this method before paralysis was apparent, 7 have been reported on and 3 were found to have subsequently developed paralysis.

Typhoid fever has closely followed in cases and deaths the low figure obtained in 1919. In but six communities has there appeared an undue incidence: —

	Cases.	Period.
Chelsea,	15	July.
Ipswich,	30	September and October.
Fall River,	34	September.
Taunton,	8	July and August.
Northampton,	13	January and February.
New Bedford,	48	January to November.
Total,	148	

The necessity of revaccinating inmates of institutions against typhoid fever is shown by the fact that in Taunton, Northampton and Foxborough State hospitals cases of typhoid fever have occurred during the year.

Intensive work in diphtheria has been carried on throughout the year, emphasizing the necessity of taking school and neighborhood cultures of contacts of clinical cases. In one community — Westfield — we have demonstrated that endemic diphtheria can be controlled by proper culturing and immunizing.

One institution, the Lyman School for Boys, has been completely Schicked and immunized with toxin-antitoxin mixture. Similar work in other State and municipal institutions which care for children will be done during the ensuing year.

Ten outbreak notices have been sent to communities showing an undue incidence of diphtheria. In nearly every instance this incidence has been due to the missed case and to direct contact. In Williamstown two outbreaks were investigated and the source of infection found to be an infected finger of a milker. It is interesting to note in connection with this outbreak that one cow developed a sore on the udder from which virulent organisms of diphtheria were obtained.

An outbreak of septic sore throat in Winchester, involving 43 cases, was traced to one milk route. It was found by culturing all persons handling the milk supply that a milker had a hemolytic streptococcus in his throat, and was evidently the source of infection in these cases.

Scarlet fever has had an unusual prevalence during the year. It is believed that because of the mild type of the infection many cases were not reported, no physician being called in attendance. The number of deaths reported will exceed that of the past few years. There were but eight outbreak notices sent out, these outbreaks being mainly due to school or community contact with the unrecognized case.

An undue incidence of measles during the year has occurred, most cases being of an extremely mild type with a low fatality rate. It is believed that the apparent increase in the total number of cases of communicable disease reported represent to a considerable degree better reporting by physicians generally rather than an actual increase in the amount of disease in the State. Early in the year arrangements were made with the Board of Registration in Medicine for closer co-operation with this Department in obtaining reports from physicians who have been persistently remiss in this respect. We have had but one instance in which it became necessary to ask their assistance during the past year.

From Dec. 1, 1919, to Nov. 30, 1920, the Diagnostic Laboratory has examined 28,637 specimens, an increase of 2,783 over the corresponding period last year. The total cost will approximate $9,000. The cost per examination is about 31 cents, which has been the average for the past five years. The increase in amount of work each year offsets the increased cost.

There has been an increase in all lines of work except the Widal test for typhoid fever and smears for gonococci. The slight decrease in Widal tests is probably due to the fact that there is less typhoid fever reported in the State. The typhoid culture work, however, has increased 65 per cent over the previous year, giving a total of approximately 900 examinations. Three typhoid carriers have been discovered.

To November 30, 545 specimens of sputum were examined for pneumococcus type. This is an increase of 50 over last year's total.

The subdivision of venereal diseases has continued its campaign for the prevention and control of venereal diseases along the same lines as in former years. A notable achievement has been the work with the courts and probation officers. Every court in the Commonwealth has been visited, our campaign outlined and the co-operation of the judge and probation officers secured.

The incidence of venereal diseases from our reports shows a decrease. We have visited several communities, interviewing the physicians, and they are unanimous in the report that they are treating fewer cases of venereal disease than in previous years.

The study groups formed last year for the discussion of venereal disease problems have been continued and much interest has been displayed. During the year 62 meetings were held with 18 groups.

More and more does it become evident that the clinic treatment is the keystone of all venereal disease control, and attendance at nearly all of the clinics is increasing. During the year three new clinics have been established. All large centers of the State are now adequately cared for by this clinic service.

All jails have been visited during the year and have been found to be complying with the law requiring the physical examination of all inmates committed for thirty days or more.

The conferences held quarterly for clinic chiefs have continued to be a marked success. The programs arranged by the subdivision have been of real merit and the attendance of the clinic chiefs has been constant.

The reorganization act of 1919 placed the Penikese Hospital for lepers under the charge of this Department. There has been little or no change in the administration of this work from that of pre-

ceding years. There are at present fifteen patients at the hospital, two of whom are soldiers cared for by the War Risk Insurance Bureau.

The labor situation has been acute all the year and only by persistent effort on the part of the superintendent has there been sufficient personnel to keep the institution up to its standards. The per capita cost is unavoidably high owing to the location of the hospital. Nothing may be purchased without a substantial addition to the first cost, due to transportation charges.

The care given by the superintendent to these unfortunate people is of the best and is reflected in an air of satisfaction and contentment in the institution.

The personnel of the Division has undergone many changes. Owing to our inability to secure properly qualified persons for District Health Officers it has appeared wise to redistrict the State into seven districts rather than eight as formerly. It is yet too soon to form an opinion, as to whether or not this plan may be worked out advantageously and without too great a burden upon the District Health Officers affected by the change.

That the tuberculosis work formerly done by this Division might be more completely co-ordinated with the work done by the sanatoria it was recommended that all tuberculosis work be transferred to the Division of Tuberculosis. This has been done and will, I believe, in the very near future give evidence of the wisdom of such a movement.

The attention of this Division was called early in July to the introduction of plague in new foci in the Southern ports. Representatives of the Department were sent to these ports to study plague preventive measures and a definite plan for rodent surveys has been outlined by which it is hoped the introduction of plague into the Commonwealth will be prevented. The surgeon general of the United States Public Health Service has detailed to this Department as well as to the health departments of the other New England States an officer who shall act in an advisory capacity on plague control methods. Preliminary surveys of all seaport cities and towns of Massachusetts have been made, together with a definite plan for a rodent survey for each, and ordinances prepared for each community to adopt. All that is needed is the necessary appropriation to put these plans into effect.

The Public Health Service early in the year delegated to this Department an epidemiological aide who has been instrumental in carrying out several mosquito surveys and who has also done special work on diphtheria in the Connecticut valley.

This Division has also lent its aid and assistance in formulating a

plan for lectures to nurses in hospital training schools. This comprises a course of nine lectures on the fundamental principles of public health, with the object of interesting this group of people in public health matters.

The multiplicity of detail which the District Health Officer handles in his district is increasing each year. During the past twelve months his assistance has been solicited in special investigations, such as the maternity investigation, in lecturing to nurses and other groups of people interested in public health, with considerable time expended in co-operative effort with the Massachusetts Tuberculosis League. Much of the success of the consultation service for the diagnosis of tuberculosis must be credited to the efforts of the field force.

With the assistance of the United States Public Health Service, an attempt has been made to establish in Barnstable County a community health organization with a full-time executive officer, trained in public health, and the necessary assistance. Great interest has been aroused and it is hoped that the local communities will appropriate, at their coming town meetings, sufficient money to make such a combination possible.

One of the difficult features of public health administration is the evaluation of the results of the efforts of those engaged in this particular endeavor.

We see, however, that here and there appears an additional public health nurse, a new nutritional or child welfare clinic, a full-time health officer replacing perhaps an untrained agent of the board, more efficient school inspection, the local board placing special emphasis upon the control of an outbreak, a survey as to the tuberculosis situation in a community, or increased consultations with the physicians in obscure cases or in helping to establish a differential diagnosis. These achievements give answer to the query so often heard, "What does the District Health Officer accomplish?" — for these are the tangible results of the persistent effort of the conscientious public health worker.

Side by side goes the nursing assistant advocating and teaching public health to the community itself. The year's work is replete with evidence of her devotion to her work. No new activity for increasing the community's public health is without her honest effort and participation. More than ever is it apparent that with these field workers must rest the task of educating the local community to its full responsibility.

Division of Tuberculosis.

The Division of Tuberculosis was organized Jan. 1, 1920, pursuant to chapter 350 of the General Acts of 1919. This act, which is known as the consolidation of departments act, abolished the Board of Trustees of Hospitals for Consumptives and transferred to the Department of Public Health all the rights, powers, duties and obligations of said board. By this act the Commissioner of Public Health was directed to establish within the Department of Public Health a Division of Sanatoria which shall include the institutions formerly under the Board of Trustees of Hospitals for Consumptives.

Previous to the passage of this act the tuberculosis work of the Department of Public Health was confined to the Division of Communicable Diseases. An important step taken by this Division was the compilation of all known cases of tuberculosis from Jan. 1, 1915, to Jan. 1, 1920. This work has been transferred to the Division of Tuberculosis. So the Division of Tuberculosis has the administrative supervision of the four State sanatoria, the compilation of all known cases of tuberculosis in the State, and the general supervision of all tuberculosis activity in the Commonwealth.

The policy of the former trustees was to admit to the State sanatoria only cases of pulmonary tuberculosis. Of this class only incipient cases were admitted to Rutland; advanced types of pulmonary tuberculosis were admitted to the other State sanatoria. Admission to the sanatoria was limited to persons over fifteen years of age, except at Westfield, where children between the ages of five and fifteen were admitted.

When it is remembered that formerly the State sanatoria were the only hospitals in the Commonwealth where consumptives were admitted, the wisdom of this policy is apparent.

The county hospital act, which provided that all cities of 50,000 population or over should maintain a tuberculosis hospital, and that cities under 50,000 should combine and maintain a county tuberculosis hospital, has given increased facilities for hospital care for tuberculous patients.

And so the Division of Tuberculosis has had under advisement the proposition of placing the four State sanatoria on an even basis. This plan proposes to admit to the sanatoria only cases favorable for arrest. It also proposes to limit the residence of patients at the sanatoria. The presence of patients at the sanatoria for five years or more is entirely incompatible with the theory of sanatorium treatment of tuberculosis. It is believed by the best minds in tuberculosis work that intensive sanatorium treatment of early, favorable cases

of pulmonary tuberculosis will arrest the disease inside of one year and turn the patient back to society capable of self-support. The old policies of restricting admission to the sanatoria to cases of pulmonary tuberculosis and of admitting children between the ages of five and fifteen years to the Westfield State Sanatorium seem sound and worthy of continuation.

For the year ending Nov. 30, 1920, there were admitted to the sanatoria 1,472 patients; discharged, 1,363; died, 251.

An important piece of work done during the past year was the examination of inmates of the prisons in the State with reference to the presence of tuberculosis. This examination was made by the staffs of the sanatoria. The following is the result of this examination: number of prisoners examined, 1,500; active cases, 7; should be under observation, 43.

The tuberculosis associations of the State are very active in securing physical examination of all contacts. At various times they have sought the aid of this Division in securing the services of the sanatoria staff for this purpose. The demands became so frequent that it was found necessary to adopt a definite policy in regard to this work, and so a series of examination clinics was inaugurated. These clinics are held in cities and towns which are not provided with a tuberculosis dispensary, in accordance with chapter 537 of the Acts of 1911. The patients for these clinics are furnished by the tuberculosis societies, and the examination is done by the sanatoria staff.

The need of assistance to physicians throughout the State in the early diagnosis of pulmonary tuberculosis has long been apparent. In order that these physicians might keep their patients as private patients and still avail themselves of consultation service, in cases where patients were unable to meet a consultant's fee, consultation clinics were inaugurated in September of this year. These clinics are held in sixteen cities. The results of three months' experience are as follows: number of cases, 170; positive diagnosis, 85; negative diagnosis, 85.

The co-operation of the public health nurse of local boards of health has been stimulated by the formation of associations of public health nurses. In every health district such an association has been formed and semi-annual meetings are held at the various State sanatoria, where tuberculosis problems are discussed.

The payment of subsidy for non-bacillary types of pulmonary tuberculosis which are receiving hospital care will materially increase the appropriation formerly made for subsidy purposes.

Division of Hygiene.

The major activities of the Division of Hygiene during the past year have been these: study of the maternity benefit problem; extension of efforts along the line of improving the nutrition of the child and of awakening in the public an appreciation of the need of mouth hygiene; extension of rural clinics; and, lastly, the prosecution of two investigations, namely, of the midwife situation and of the open-air school.

The beginning of the legislative year saw the introduction of various bills providing for better care of maternity and infancy. The Division of Hygiene studied these bills carefully and made estimates for the information of the Legislature as to the cost of administration of one form or another, were such a law to be enacted. Many requests came in from women's clubs and others for a critical estimate of the value of such legislation.

The facts upon which suggested legislation was predicated are undeniable. The loss of over 700 mothers annually from causes related to childbirth, many of these from causes clearly preventable, the loss of nearly 4,000 infants under one month of age, and the loss of 2,500 babies stillborn; these, and the additional facts of maternal and infant ill-health and disability are sufficient to render it imperative to attempt some remedy.

The creation by the Legislature of a recess commission to study the problems involved in maternity benefits gave an additional opportunity to the Director and staff of the Division of Hygiene to study this subject so bound up with the most vital part of the Division's work. This study, begun under the auspices of the Maternity Benefit Commission, ought to be carried on by the Division of Hygiene through a series of years, regardless of the passage of specific legislation regarding maternity protection. This would have been done previously but for the lack of an adequate force and funds. Profiting by the experiences gained during the summer, such an investigation could be carried along with much greater ease than would heretofore have been the case.

An investigation into the midwife situation in this State has recently been made. Massachusetts has been criticized because of its illogical method of handling the midwife. Obliged by law to report births, the midwife is liable to prosecution for practicing medicine illegally if she does report them. Attempts have been made to abolish the midwife but without avail, as figures will show.

The investigation undertaken this year by the Division of Hygiene furnished information upon which could be based some estimate as

to the number of midwives practicing and as to the type of work done by them. A series of nine representative cities and towns was chosen for careful study. In these towns two keen investigators found 117 midwives practicing and obtained information which would point to still others. Certain of these midwives are graduates of training schools abroad; others have had little or no training of any kind. Some apparently have a fair idea as to cleanliness and an appreciation of their limitations; others have neither the one nor the other. There is reason to believe that repressive measures have done more to discourage the practice of the better grade midwives than of the poorer ones who are willing to take a greater chance with the law. A proper solution of the midwife problem is yet to be made and this is a subject which must be considered very carefully again during the coming year.

A further investigation of the open-air schools of the State has been made this year in the course of which practically all the open-air schools or classes in Massachusetts were visited. Answers to questionnaires were obtained as to the practice in respect to such schools in other States. It was hoped that possibly sufficient light would be thrown on this problem so that tentative uniform standards might be suggested. However, it does not appear that this can safely be done at present, and study and experience along these lines in the near future seem to be indicated.

Several years have elapsed since educational effort directed towards the practical application of the facts of nutrition to personal hygiene and the public health was begun in the Division of Hygiene. With printed material and lectures as a beginning, the work has developed until vital contact is now had with practically all the agencies of the State interested in this type of work. Contact with public groups through the medium of illustrated lectures has reached the point where one worker can no longer meet the demand. The great object of the Division now is to be of assistance in the gradual process of bringing the dietitian or nutritionist — the heir of the "cooking teacher" — from a position of isolated specialist into the fellowship of public health workers in general.

Hand in hand with the development of an interest in nutrition is going interest in mouth hygiene. The latter field is newer in point of time but bids fair to be tilled with equal rapidity owing to the tremendous appeal which oral hygiene seems to be making at the present time to the general public. As in the case of the nutrition work, the first step in mouth hygiene activity in this Division was through public lectures and the printed word. The work has grown to the same point referred to under the head of nutritional activities.

One field worker is no longer sufficient to meet the demands. Requests for advice on new problems involving the establishment of new centers in municipalities for mouth hygiene work and the co-ordination of the newer with the older public health activities are becoming more pressing every day. The exponent of mouth hygiene, like the nutritionist, must be helped to find a secure and logical place within the ranks of public health workers.

The newest activity of the Division of Hygiene bids fair to be one of great importance. Starting in a modest way a year ago at the agricultural fairs, the rural clinic service has developed into a whole-time piece of work which has won for itself a definite place in the Division's activities. The aim of the rural clinics is to demonstrate by the examination of children the need of greater attention being paid to their normal development. The ultimate aim of this work is to so demonstrate the need for such preventive and corrective facilities for children that communities will institute and provide such facilities as a permanent thing.

Division of Biologic Laboratories.

Certain changes have been made in the organization of this Division during the past year, the principal one being the appointment of a full-time director, an arrangement which has proved most successful. The volume of work of both branches of the Division of Biologic Laboratories — the Antitoxin and Vaccine Laboratory and the Wassermann Laboratory — show a noteworthy increase over the previous year. During the coming year it will be absolutely necessary to somewhat increase the present small force in order to properly handle the increased work; as has been stated previously the present quarters afford altogether too little space for the number of workers and the amount of work being done. The problem of providing for the expansion of the laboratories and their permanent housing is still to be settled.

A considerable saving has been effected by purchasing supplies on bids and in quantity, and by standardizing the various apparatus and supplies used.

The accompanying table shows the production, distribution and stock on hand of all products of the Antitoxin and Vaccine Laboratory for the past two years and is a very interesting exhibit of the work of the Laboratory for this period (see next page). With reference to production it is interesting to note that the amount of blood taken from immune horses at each semimonthly bleeding has been increased by approximately 30 per cent. The horses have borne the increased bleedings with no ill effects and production has been increased by the

above figures. The methods formerly used in the vaccination of calves for the production of smallpox vaccine have been changed, with the result that the yield of vaccine from each calf has been increased approximately 75 per cent.

On Feb. 1, 1920, the average potency of diphtheria antitoxin produced was 230, whereas the serum will average approximately 450 units at the present time. The 100 per cent increase in the average potency of all diphtheria antitoxin produced during the year has been made possible by the stronger toxin available and by the change in the method of immunizing diphtheria horses.

Product.	1919.			1920.		
	Liters.	Total 1,000 Unit Doses.	Units per c.c.	Liters.	Total 1,000 Unit Doses.	Units per c.c.
1. Diphtheria antitoxin:						
Produced,	602.26	–	–	769.1	–	–
Distributed,	646.067	143,101	221	482.0	179,756	372
On hand,	72.3	–	–	232.4	–	–
2. Diphtheria plasma:						
Produced,	–	–	–	1,126.6	–	–
Used in concentration,	–	–	–	725.	–	–
On hand,	–	–	–	369.1	–	–
3. Concentrated diphtheria antitoxin:						
Produced,	165.95	–	–	158.6	–	–
Distributed,	109.05	16,028	147	100.73	38,471	381
On hand,	60.	–	–	55.2	60,720	1,100

Product.	1919.		1920.	
	Liters.	Total Doses.	Liters.	Total Doses.
4. Antimeningococcic serum:				
Produced,	86.5	5,766	317.665	21,177
Distributed,	67.365	4,565	48.310	3,585
On hand,	31.	–	47.2	–
5. Antipneumococcic serum, Type I:				
Produced,	23.800	238	147.700	1,477
Distributed,	42.200	422	44.4	444
On hand,	36.925	369.25	100.700	1,007
6. Smallpox vaccine:				
Produced,	2.349	140,940	4.844	290,610
Distributed,	3.247	194,807	3.151	189,064
On hand,	–	–	1.624	97,440
7. Typhoid paratyphoid vaccine:				
Produced,	112.3	112,300	73.5	73,500
Distributed,	74.123	74,123	49.191	49,191
On hand,	–	–	16.6	16,600
	Outfits.	Total Doses.	Outfits.	Total Doses.
8. Schick outfits:				
Produced,	96.	9,600	91.	9,100
Distributed,	96.	9,600	63.	6,300
On hand,	–	–	30.	3,000

Product.	1919.		1920.	
	Liters.	Total Doses.	Liters.	Total Doses.
9. Diphtheria toxin-antitoxin:				
Produced,	–	–	6,443	6,443
Distributed,	1,108	1,108	3,614	3,614
On hand,	–	–	2,829	2,829
	Liters.	Potency.	Liters.	Potency.
10. Diphtheria toxin:				
Produced,	533.	.006	539.	.0025
Used,	583.	.006	456.	.0025
On hand,	20.	.006	83.	.0025

Wassermann Laboratory.

During the past year the activities of the Wassermann Laboratory have been confined to the execution of tests established during previous years. Its personnel has not changed in number but the volume of its work shows a noteworthy increase over that of 1919 as indicated in the following table: —

	1919.	1920.	Increase (Per Cent).
Wassermann tests,	31,485	37,277	18
Gonococcus fixation tests,	222	1,758	609
Diagnostic examinations for Department of Animal Industry: —			
(*a*) Complement fixation test for glanders,	122	237	94
(*b*) Examination for rabies,	84	161	88
(*c*) Pathologic and bacteriological examinations,	79	65	-[1]
Totals,	31,992	39,498	23.5

[1] Decrease.

In addition to these activities, investigations carried on by this laboratory on the utility of complement fixation as a clinical aid in the diagnosis of tuberculosis have shown that the test at present is not sufficiently dependable for the purpose.

Division of Food and Drugs.

During the year just passed, 10,847 samples were examined and 311 cases were prosecuted. This figure represents a slight increase in prosecutions over last year's figures, but a decrease in the number of samples collected, due largely to weather conditions in the early part of the year when transportation was practically stopped.

There has been rather more special co-operative work with local boards of health than heretofore. Analyses have been furnished to the milk inspectors or health officers of Barnstable, Lawrence, Newton, North Adams, Fitchburg, Weymouth, Arlington, New Bedford and Woburn, and the milk inspectors or agents of the boards of health of Springfield, Fitchburg, Fall River, Newton and Somerville have furnished this Department information resulting in the collection of evidence relative to violations of the law.

The liquor samples are nearly as numerous as those submitted last year, but all the samples submitted were intended for prosecution in the Massachusetts courts, a marked contrast to the large numbers submitted and examined last year for prosecution in the United States courts. Fifty cities and towns submitted samples during the year. The character of the samples submitted has changed materially from those submitted in former years. Most of the samples formerly submitted consisted of beer, cider and wine. More than half the samples now submitted consist of distilled liquors.

Special investigations outside of the usual work upon milk and eggs have been made of sausages, dried fruits, salad dressing, sugar, clams and soft drinks. It was found that many of the soft drink manufacturers were using saccharine. Most of these persons ceased this practice after being given a hearing. Those who did not were prosecuted, and in all cases convictions have been obtained.

The usual investigations of the cold-storage warehouses and cold-storage food have been made during the year as well as the usual investigations of slaughtering under Massachusetts inspection. Relative to the latter, a number of violations were found in Berkshire County, such as selling unwholesome meat and selling meat obtained from diseased animals. Convictions were secured in these instances. In general, however, the local slaughtering inspection is carried out in a satisfactory manner.

During the year a new bakery law has been enacted, to be enforced jointly by this Department and local health authorities. Regulations have been adopted after a series of conferences with local boards of health and certain bakeries. One inspector has been assigned to work under this law. The bakeries of certain cities have already been inspected, and it is proposed to inspect all the bakeries in the State in this manner during the coming year.

In connection with the co-operative purchasing plan of the State institutions, a number of analyses have been made for the Department of Public Welfare, these analyses being confined to soap chips, soap bars and milk powders. The soap chips are being purchased upon specifications and each barrel is examined to see whether or

not the chips conform with the specifications. It was intended to purchase coal in this manner, and the apparatus has been purchased, but owing to the fact that no competitive bids could be obtained, no analyses of coal have been made as yet.

Since January 1 the arsphenamine production has been sufficient to supply all the needs of the Department. A new method for the recovery of toxic batches has been developed by the staff of the department of pharmacology of the Harvard Medical School, the head of which department, Dr. Reid Hunt, has served as pharmacologist to test the toxicity of arsphenamine ever since this Department commenced its manufacture. This method has been applied to several toxic batches and the resulting purified product has been used successfully in the clinics. The process seems to produce a purer product than the process usually employed, and steps are now being taken to manufacture all our arsphenamine by this process.

Appropriations and Expenditures for the Year ended Nov. 30, 1920.

Division of Administration.

Appropriation for personal services,	$21,100 00
Expended for personal services,	20,343 62
Balance,	$756 38
Appropriation for expenses,	$11,500 00
Brought forward from 1919 to cover sundry charges,	66 50
Credit by refund,	12 00
	$11,578 50
Traveling,	$503 13
Express,	145 12
Printing and binding,	5,288 15
Books and subscriptions,	377 25
Advertising,	15 28
Stationery, maps and blue prints,	811 26
Postage and postal orders,	1,673 82
Telephone and telegraph messages,	966 84
Typewriter supplies and repairs,	144 39
Sundry office supplies,	101 35
Messenger,	274 90
Miscellaneous,	79 82
Total,	$10,381 31
Unexpended balance,	1,197 19
	$11,578 50

Division of Hygiene.

Appropriation for personal services,	$18,645 00
Expended for personal services,	16,690 26
Balance,	$1,954 74
Appropriation for expenses,	$20,500 00
Brought forward from 1919 on account of cancer investigation,	1,801 54
Transfers from Administration appropriation,	292 39
	$22,593 93
Traveling,	$5,029 22
Express,	268 05
Printing and binding,	6,977 57
Books and subscriptions,	53 36
Advertising and educational work,	2,159 20
Stationery, maps and blue prints,	412 25
Postage,	849 94
Telephone and telegraph,	99 20
Typewriting supplies and repairs,	136 73
Moving-picture expenses,	92 58
Automobile truck expenses,	1,101 95
Office supplies,	328 62
Laboratory supplies,	31 69
Special investigations,	3,173 62
Miscellaneous,	76 12
Total,	$20,790 10
Unexpended balance,	1,803 83
	$22,593 93

Division of Communicable Diseases.

Appropriation for personal services,	$55,500 00
Expended for personal services,	54,969 03
Balance,	$530 97
Appropriation for expenses,	$22,500 00
Brought forward from 1919,	168 60
Credit account of cash returned to treasury,	4 50
	$22,673 10

Traveling,	$11,933 26
Express,	37 19
Printing and binding,	1,223 90
Books and maps,	164 85
Postage,	1,500 85
Typewriter supplies,	35 50
Extra services (field),	274 33
Telephone and telegraph,	889 13
Office supplies and stationery,	946 00
Laboratory and experimental work,	3,069 46
Furniture,	753 08
Animals,	174 25
Food for animals,	19 29
Labor,	62 05
Office rent and light,	1,187 13
Miscellaneous,	55 80
Total,	$22,326 07
Unexpended balance,	347 03
	$22,673 10

Subdivision of Venereal Diseases.

Appropriation for personal services,	[1] $5,200 00
Expended for personal services,	8,949 83
Balance withdrawn from Federal fund,	$3,749 83
Appropriation for expenses,	[1] $11,342 50
Traveling,	$2,269 99
Printing and binding,	151 95
Reprints, books and maps (educational),	1,641 33
Typewriter supplies,	4 00
Extra services (field),	50 00
Telephone and telegraph,	28 65
Office supplies and stationery,	98 19
Clinics,	9,458 34
Furniture,	9 00
Miscellaneous,	1 75
Total,	$13,713 20
Balance withdrawn from Federal fund,	2,370 70
	$11,342 50

[1] An equal amount received from the United States government for venereal disease control activities in accordance with the provisions of the Chamberlain-Kahn act does not appear as State appropriation.

Division of Biologic Laboratories.

Appropriation for personal services,	[1] $29,740 00
Expended for personal services,	29,120 94
Balance,	$619 06
Appropriation for expenses,	[1] $26,500 00
Credit account of refunds to treasury,	438 15
	$26,938 15
Apparatus, chemicals and laboratory supplies,	$8,489 23
Traveling,	222 94
Express,	136 18
Books, stationery, office supplies and furniture,	961 50
Printing,	618 84
Purchase of animals,	3,057 75
Shipping,	1,135 19
Services of veterinary surgeon and saddlery,	9 30
Food for animals,	7,601 20
Rental of telephone, messages and postage,	515 17
Rent,	2,058 32
Water, gas, electric lighting and heating,	1,251 96
Labor and materials,	1,215 17
Ice,	647 20
Miscellaneous,	656 02
Total,	$28,575 97
Balance withdrawn from Federal fund,	1,637 82
	$26,938 15

Division of Food and Drugs.

Appropriation for personal services,	$28,750 00
Expended for personal services,	28,359 65
Balance,	$390 35
Appropriation for expenses,	$11,000 00
Brought forward from 1919,	7 80
	$11,007 80
Apparatus and chemicals,	$1,688 46
Traveling,	6,524 98
Purchase of samples,	516 04
Express,	20 75

[1] An additional amount equal to one-half of expenditures of Wassermann Laboratory received from the United States government for venereal disease control activities in accordance with the provisions of the Chamberlain-Kahn act does not appear as State appropriation (approximately $5,000).

Printing,	$498 69
Books, maps and stationery,	441 64
Telephone, telegraph messages and postage,	186 15
Sundry laboratory supplies,	499 27
Typewriter supplies and repairs,	115 78
Branding outfits,	78 74
Labor,	10 80
Professional services,	225 00
Miscellaneous,	3 04
Total,	$10,809 34
Unexpended balance,	198 46
	$11,007 80

MANUFACTURE AND DISTRIBUTION OF ARSPHENAMINE.

Appropriation for personal services,	[1] $5,250 00
Expended for personal services,	8,156 77
Balance withdrawn from Federal fund,	$2,906 77
Appropriation for expenses,	[1] $3,775 00
Brought forward from 1919,	5 77
Credit account of refund,	25 00
	$3,805 77
Apparatus, chemicals and laboratory supplies,	$2,512 68
Professional services,	733 33
Animals,	510 40
Travel,	115 20
Express,	81 18
Rent,	900 00
Labor,	69 96
Purchase of arsphenamine,	1,660 96
Heat and light,	414 57
Ice,	45 63
Telephone,	35 04
Water,	21 00
Shipping,	1,158 23
Printing and binding,	19 40
Miscellaneous,	78 84
Total,	$8,356 42
Balance withdrawn from Federal fund,	4,550 65
	$3,805 77

[1] An equal amount received from the United States government for venereal disease control activities in accordance with the provisions of the Chamberlain-Kahn act does not appear as State appropriation.

Division of Sanitary Engineering.

Appropriation for personal services,	$33,500 00
Expended for personal services,	28,882 14
Balance,	$4,617 86
Appropriation for expenses,	$11,200 00
Brought forward from 1919,	7 15
	$11,207 15
Apparatus and materials,	$1,650 53
Traveling,	4,096 08
Express,	1 96
Printing and binding,	239 71
Maps, blue prints and books,	259 25
Stationery, drawing materials and office supplies,	1,077 06
Telephone, telegraph messages and postage,	235 14
Services, collecting samples and reading gauges,	351 95
Furniture and equipment,	1,132 44
Miscellaneous,	74 94
Total,	$9,119 06
Unexpended balance,	2,088 09
	$11,207 15

Division of Water and Sewage Laboratories.

Appropriation for personal services,	$28,500 00
Expended for personal services,	26,470 27
Balance,	$2,029 73
Appropriation for expenses,	$5,000 00
Credit by refunds to treasury,	148 43
	$5,148 43
Apparatus and materials,	$2,878 03
Traveling,	386 97
Express,	1,275 67
Printing and binding,	158 40
Maps, blue prints and books,	17 75

Stationery, drawing materials and office supplies,	$130 67
Telephone, telegraph messages and postage,	53 82
Labor,	40 80
Rent,	150 00
Miscellaneous,	32 30
Total,	$5,124 41
Unexpended balance,	24 02
	$5,148 43

Division of Tuberculosis (Sanatoria).

Appropriation for personal services,	$12,170 00
Expended for personal services,	11,850 83
Balance,	$319 17
Appropriation for expenses,	$2,700 00
Credit by cash returned to treasury,	48 89
	$2,748 89
Traveling,	$1,343 46
Printing,	491 34
Telephone and telegraph,	66 10
Books and subscriptions,	60 19
Stationery,	219 94
Postage,	230 10
Office equipment,	13 00
Miscellaneous,	79 50
Total,	$2,503 63
Unexpended balance,	245 26
	$2,748 89
Appropriation to cover payment of subsidies to which certain cities and towns are entitled under the provisions of chapter 597, Acts of 1911, as amended by chapter 290, General Acts of 1917,	$173,596 12

State Examiners of Plumbers.

Appropriation for the year ended Nov. 30, 1920,	$4,620 00
Brought forward from 1919,	219 86
	$4,839 86

Salaries and examiners' wages,	$3,478 06
Traveling,	510 94
Express,	34 97
Printing,	349 56
Postage,	79 44
Books and stationery,	42 32
Plumbers' materials,	30 25
Extra services,	105 15
Cleaning,	17 00
Office supplies,	19 77
Telephone and lighting,	106 16
Miscellaneous,	8 25
Total,	$4,781 87
Unexpended balance,	57 99
	$4,839 86

PENIKESE HOSPITAL.

Appropriation for the year ended Nov. 30, 1920,	$34,820 00
Salaries,	$13,742 12
Traveling, transportation and office expenses,	1,887 88
Food,	6,173 32
Clothing and materials,	723 12
Furnishings and household supplies,	1,354 84
Medical and general care,	2,076 44
Heat, light and power,	4,358 47
Farm and stable,	3,857 21
Grounds,	54 52
Repairs, ordinary,	1,464 75
Total,	$35,692 67
Deficit,	872 67

Recapitulation.

	Appropriation plus Credits.	Total Appropriation.	Expended.
For the Division of Administration,	$32,600 00 78 50	$32,678 50	$30,724 93
For the Division of Hygiene,	39,145 00 2,593 93	41,738 93	37,480 36
For the Division of Communicable Diseases,	78,000 00 173 10	78,173 10	77,295 10
For the Subdivision of Venereal Diseases,	. . .	16,542 50[1]	22,663 03
For the Division of Biologic Laboratories,	56,240 00 438 15	56,678 15[2]	57,696 91
For the Division of Food and Drugs,	39,750 00 7 80	39,757 80	39,168 99
For the manufacture and distribution of arsphenamine,	9,025 00 30 77	9,055 77[1]	16,513 19
For the Division of Sanitary Engineering,	44,700 00 7 15	44,707 15	38,001 20
For the Division of Water and Sewage Laboratories,	33,500 00 148 43	33,648 43	31,594 68
For the Division of Tuberculosis (Sanatoria),	14,870 00 48 89	14,918 89	14,354 46
For subsidies to cities and towns,	. . .	173,596 12	173,596 12
For the State Examiners of Plumbers,	4,620 00 219 86	4,839 86	4,781 87
For the maintenance of Penikese Hospital,	. . .	34,820 00	35,692 67
Totals,	. . .	$581,155 20	$579,663 51

[1] An equal amount received from the United States government for venereal disease control activities.

[2] Approximately $5,000 additional received from the United States government for venereal disease control activities in accordance with the provisions of the Chamberlain-Kahn act. These sums of money do not appear as State appropriation.

Expenditures of Tuberculosis Sanatoria for the Year ended Nov. 30, 1920.

	Rutland.	Lakeville.	Westfield.	North Reading.	Totals.
Appropriation for maintenance,	$304,280 00	$201,810 48	$196,503 00	$163,355 00	$865,948 48
Balance brought forward from previous year.	3,722 33	–	–	789 48	4,511 81
	$308,002 33	$201,810 48	$196,503 00	$164,144 48	$870,460 29
Personal services,	$115,107 90	$86,245 11	$82,998 08	$57,876 35	$342,227 44
Religious instruction,	1,800 00	1,131 44	1,189 60	1,600 00	5,721 04
Travel, transportation and office expenses.	3,184 34	1,947 37	1,841 38	2,036 06	9,009 15
Food,	93,199 34	31,771 18	39,968 30	56,699 78	221,638 60
Clothing and materials,	239 64	14 95	979 89	936 63	2,171 11
Furnishings and household supplies,	10,455 68	5,946 08	10,034 44	6,285 84	32,722 04
Medical and general care,	8,787 89	3,866 35	3,365 87	3,308 26	19,328 37
Heat, light and power,	30,734 22	12,827 04	14,859 63	12,514 78	70,935 67
Farm,	20,419 85	39,236 88	16,889 89	8,400 25	84,946 87
Garage, stable and grounds,	7,181 58	7,867 16	5,082 98	2,724 75	22,856 47
Repairs, ordinary,	9,129 09	7,233 25	9,950 06	3,412 98	29,725 38
Repairs and renewals,	1,090 48	654 06	9,325 54	3,735 72	14,805 80
Total expenditures,	$301,330 01	$198,740 87	$196,485 66	$159,531 40	$856,087 94
Unexpended balance,	$6,672 32	$3,069 61	$17 34	$4,613 08	$14,372 35
Average number of inmates,	345	231	265	188	1,029
Weekly per capita cost,	$16 78	$16 50	$14 24	$16 29	$16 00
Receipts for board of inmates,	$48,712 23	$34,574 10	$42,187 19	$29,322 30	$154,795 82
Receipts from sales,	830 87	1,070 16	1,541 96	796 13	4,239 12
Total receipts,	$49,543 10	$35,644 26	$43,729 15	$30,118 43	$159,034 94

Special Appropriations — Tuberculosis Sanatoria.

Rutland.

Appropriation for —	Act or Resolve.	Amount.	Total expended to Nov. 30, 1920.	Balance carried to Next Year.
Kitchen, service and storehouse buildings, .	Chap. 55, 1918	$55,000 00	$53,905 74	$1,094 26

Lakeville.

Shelter for young stock, ...	Chap. 629, 1920	$2,500 00	$1,696 52	$803 48
Generator unit, ...	Chap. 629, 1920	9,005 00	153 30	8,851 70
Purchase of land, ...	Chap. 153, 1919	2,500 00	–	2,500 00
		$14,005 00	$1,849 82	$12,155 18

Westfield.

Purchase of land, ...	1920	$1,890 00	–	$1,890 00
Remodeling barn, ...	1920	5,700 00	$5,662 76	37 24
Remodeling farmhouse and dormitory, .	1920	10,000 00	9,988 23	11 77
Installing engine and generator, . . .	1920	6,500 00	1,311 90	5,188 10
		$24,090 00	$16,962 89	$7,127 11

North Reading.

Nurses' hall and chapel, ...	Chap. 211, 1919	$48,150 00	$48,144 42	$5 58[1]
Cottage for engineer and steward, .	Chap. 629, 1920 Chap. 225, 1920	16,500 00	9,611 29	6,888 71
		$64,650 00	$57,755 71	$6,894 29

[1] Reverting to treasury of Commonwealth.

SUPPLEMENT

Division of Sanitary Engineering

X. H. Goodnough, *Director*

REPORT OF DIVISION OF SANITARY ENGINEERING.

During 1920, as in the years which immediately preceded, the conditions brought about by the war — scarcity and excessive prices of labor and material — have continued to prevent the construction of necessary public works, especially water supplies and sewerage systems. Furthermore, the remarkably high rainfall — the greatest in thirty years — following the high rainfall of preceding years has furnished an abundant supply of water from nearly all sources of water supply in use in the State, including many which are now being used in excess of their safe capacity. At the same time, the high rainfall has maintained a high flow in the streams, and thus has caused a greater dilution of polluting substances than has been the case in any previous year for more than a quarter of a century.

The Department received during the year 141 applications in relation to water supply, drainage, sewerage, the pollution of streams and similar matters, the number being about the same as for several years. Of these, 40 were in relation to public water supplies, 55 in relation to wells and springs used mainly as sources of water supply for factories, camps and summer colonies, 7 to sources of ice supply, 17 to sewerage, drainage and sewage disposal, 5 to pollution of streams, and 17 to miscellaneous matters. One new water supply was introduced during the year, the works being constructed by a water company for the supply of the town of Auburn, and a very few additions were made to existing water supplies.

The total population of the State by the Census of 1920 was 3,852,356, of which 3,702,549 were included in cities and towns having public water supplies in the whole or in part of their territory. The towns not yet provided with water supplies number 138, the aggregate population of which in 1920 was 149,807. There still remain 13 towns, having in 1920 a population in excess of 2,500, which are not provided with public water supplies. These towns are the following: —

Town.	Population.	Town.	Population.
Tewksbury,	4,450	Wilmington,	2,581
Templeton,	4,019	Sutton,	2,578
Somerset,	3,520	Hanover,	2,575
Warren,	3,467	Dighton,	2,574
Westport,	3,115	Harvard,	2,546
Seekonk,	2,898	Bourne,	2,530
Wilbraham,	2,780		39,633

In most of these towns and in many others of smaller size, public water supplies are very badly needed, not only for public comfort and convenience and for protection from fire, but principally for the protection of health, since the well waters, which are the main sources of supply in most of the villages of the State not yet provided with public works, are usually more or less polluted and in many cases wholly unfit for use. In many of these long-settled communities sewage has been disposed of by discharging it into vaults and cesspools for many years, and seepage from these sources of contamination, which tends to flow to a lower level, pollutes the ground water and commonly finds its way to the nearest well or perhaps to several wells where the ground water is lowered on account of the draft for domestic use. The results of the continuous discharge of sewage into the ground about the dwelling houses in villages are to a considerable extent cumulative, and the water of wells in such communities usually grows worse from year to year.

Private Wells.

In consequence of the pollution of wells in the thickly populated villages not yet provided with public water supplies and of the general spread of the knowledge of the fact that a pure water supply is the most valuable agent in the maintenance of health, the Department is receiving an increased number of applications for the examination of private or semi-public sources of water supply, that is, supplies used for farms and village dwellings often used by two or more families. The results of the tests of a limited number of these sources which have been examined during the past year have shown that the majority of the wells brought to the attention of the Department were very badly polluted and unsafe for domestic use. The amount of this work is constantly growing, and properly attended to is no doubt a great aid in the protection of the public health from the dangers following the use of impure water. This work requires

expert care to avoid the condemnation of sources which may safely be used and subjecting the owner or occupant of such premises to a serious expense for a new well or other source of water supply, and to avoid at the same time the approval of sources which may be the cause of great injury to health. The danger from the use of polluted wells needs no emphasis, and is now becoming so well understood that the requests for examinations of such sources are increasing, and further provision for this work will have to be made if it is to be continued and properly carried out.

Water Supplies of Camps.

A most notable increase in the work of this Division has been brought about by the multiplication of the number of camps for associations of all sorts since the close of the war. Most of these camps are located along the banks of the rivers or near the shores of lakes or ponds usually remote from any source of public water supply. A supply of drinking water is obtained in these cases usually from some neighboring spring or well, or by sinking a well at the most convenient point on the premises. The danger to the public health of the use of an improper or infected water supply in such places is obvious, and this Division has sought to meet the demands for sanitary examinations of such communities as promptly and effectively as possible, a work that has been difficult under the existing circumstances and one which if it is to be continued will require a larger organization.

Difficulties of providing Water and Sewerage Facilities in Certain Districts.

Attention has been called to the problem in water supply and sewerage brought about by the development of lands for occupation by summer cottages and camps, which have been increasing very rapidly not only on the seashore but also along the banks of rivers and the shores of lakes and ponds. A similar important problem is that of water supply and sewerage in connection with real estate developments adjacent to or in the neighborhood of cities and larger towns. In some places lands are built upon which are so located or are of such a character that it is impracticable to provide them with a public water supply or an effective system of sewerage or drainage unless at excessive cost.

The attention of the Department has been called to a number of such districts where houses, sometimes in large numbers, have been

constructed on rocky hills, mostly in outlying territory, where the ledge has little or no earth covering and where it is impracticable or exceedingly difficult and expensive to construct water and sewer mains and service pipes. The purchaser of lands in such cases often fails to realize or gives little heed to the difficulties he is likely to meet in maintaining satisfactory sanitary conditions in and about his premises, and the municipality hesitates to extend proper water supply and sewerage service to such a district. In other cases, areas of low, wet land have been built upon where proper drainage is impracticable except at an expense which may be far in excess of the value of the property involved. Such conditions have been overcome and made satisfactory in a few municipalities by taking advantage of the laws providing for a board of survey, or a planning board if the powers and duties of the board of survey are placed in its hands. The board of survey, under existing laws, is empowered to examine, hold hearings, and pass upon all schemes for new development of real estate at the outset and before any construction work is undertaken. The public is thus given an opportunity to learn the dangers of building in a locality deemed objectionable by the board of survey. Such publicity, if placed in the hands of properly trained officials, would not only secure better development of the new districts in cities and towns but would aid greatly in preventing the development of undesirable areas for residential purposes, and prevent the danger to the public health which such settlements entail.

Many of the difficulties arising from objectionable real estate developments could be prevented if cities and towns generally would accept and put in force the board of survey laws already provided by the Legislature.

Rainfall and Flow of Streams.

The rainfall for the year 1920 was greatly in excess of the normal, and during the first six months of the year was probably the greatest that has occurred in a period of fifty years. On the Wachusett watershed near the middle of the State the excess of rainfall over the normal amounted to 10.34 inches and an excess occurred in every month of the year, with the exception of January, August and October. The flow of the Nashua River during 1920, as measured by the Metropolitan Water Board at Clinton, exceeded that of any year since the observations of the flow of that stream were established twenty-four years ago. The flow of the stream was much less than the normal in the months of January and February, a condition due largely to an exceptionally cold winter, since the precipitation in

those months was chiefly in the form of snow. Slight deficiencies also occurred in August and October, but in the other months the flow was in excess of the normal, that of March being the greatest that has occurred in that month in any year since measurements of the flow of this river were begun.

Sanitary Protection of Public Water Supplies.

The importance of efficient sanitary protection of public water supplies has been emphasized again by the occurrence of a great epidemic of typhoid fever in a middle western State. In this case the water supply of a town of 10,305 inhabitants became contaminated, a condition which was followed by the occurrence of about 882 cases of typhoid fever and 25 deaths, a rate of about 24 per 100,000 of population. This epidemic calls attention once more to the calamitous results which may follow the pollution of a public water supply, and emphasizes again the need of giving to public water supplies all the protection possible against danger of infection from whatever cause. The death rate from typhoid fever in Massachusetts in 1887, the first year after the establishment of supervision of the water supplies by the State, was 45 per 100,000 of population, while in the year 1920 the death rate was 2.5 per 100,000, in all probability the lowest of any State in the Union. In a large degree this decrease is a measure of the improvement in water supplies and in the efficiency of their protection during that period.

Examination of Water Supplies.

The usual examinations of water supplies have been carried on during the year and many of the sources have been inspected by the engineers of this Division. The waters of the various sources have been analyzed chemically and microscopically, the latter in the case of surface waters, and bacterial tests have been made where such tests appeared to be necessary or desirable. In very few cases have emergency water supplies been found necessary, the high rainfall insuring an adequate supply in practically all cases from existing works.

Following are average results of chemical analyses of the sources of public water supply examined in 1920.

Analyses of the Water of Public Water Supplies.

Averages of Chemical Analyses of Surface-water Sources for the Year 1920.

[Parts in 100,000.]

City or Town.	Source.	Color.	Residue on Evaporation.	Ammonia.			Chlorine.	Hardness.
				Free.	Albuminoid.			
					Total.	Suspended.		
Metropolitan Water District.	Wachusett Reservoir, upper end,	.27	3.78	.0026	.0157	.0023	.25	1.1
	Wachusett Reservoir, lower end,	.15	3.52	.0020	.0120	.0019	.27	1.1
	Sudbury Reservoir,	.17	4.12	.0028	.0135	.0024	.31	1.4
	Framingham Reservoir No. 3,	.19	4.08	.0034	.0161	.0029	.31	1.5
	Hopkinton Reservoir,	.60	4.28	.0041	.0188	.0033	.32	1.1
	Ashland Reservoir,	.59	4.32	.0027	.0180	.0028	.29	1.3
	Framingham Reservoir No. 2,	.79	6.40	.0067	.0230	.0037	.62	1.6
	Lake Cochituate,	.22	6.12	.0027	.0204	.0044	.64	2.6
	Chestnut Hill Reservoir,	.18	4.07	.0026	.0119	.0020	.33	1.5
	Weston Reservoir,	.17	4.04	.0027	.0134	.0018	.35	1.5
	Spot Pond,	.10	4.00	.0014	.0130	.0024	.33	1.4
	Tap in State House,	.18	4.18	.0013	.0112	.0015	.33	1.5
	Tap in Revere,	.08	3.91	.0010	.0113	.0014	.34	1.5
	Tap in Quincy,	.15	4.02	.0006	.0104	.0012	.33	1.6
Abington,	Big Sandy Pond,	.10	4.47	.0028	.0127	.0018	.68	1.4
Adams (Fire District).	Dry Brook,	.18	6.47	.0011	.0072	.0002	.14	4.7
	Bassett Brook,	.00	3.92	.0010	.0041	.0003	.11	2.5
Amherst,	Amethyst Brook large reservoir,	.41	3.31	.0008	.0132	.0011	.14	0.8
	Amethyst Brook small reservoir,	.16	3.10	.0007	.0090	.0016	.13	0.8
Andover,	Haggett's Pond,	.15	4.53	.0018	.0148	.0023	.40	1.9
Ashburnham,	Upper Naukeag Lake,	.08	2.39	.0009	.0092	.0005	.15	0.5
Ashfield,	Bear Swamp Brook,	.26	5.10	.0009	.0124	.0012	.09	2.8
Athol,	Phillipston Reservoir,	.75	5.10	.0046	.0196	.0033	.18	1.2
	Buckman Brook Reservoir,	.28	3.67	.0072	.0215	.0069	.16	1.0
	Inlet of filter,	.30	3.93	.0035	.0178	.0041	.13	1.0
	Outlet of filter,	.49	3.81	.0026	.0171	–	.15	1.1
Barre,	Reservoir,	.13	4.25	.0016	.0206	.0046	.33	1.4
Blandford (Fire District).	Freeland Brook,	.05	4.05	.0008	.0040	.0005	.28	1.4
Brockton,	Silver Lake,	.16	3.80	.0013	.0119	.0014	.55	0.7
Cambridge,	Lower Hobbs Brook Reservoir,	.27	6.04	.0042	.0213	.0026	.45	2.5
	Upper Hobbs Brook Reservoir,	.51	6.74	.0069	.0233	.0034	.47	2.7
	Stony Brook Reservoir,	.36	6.25	.0047	.0203	.0025	.52	2.7

Averages of Chemical Analyses of Surface-water Sources, etc. — Continued.

[Parts in 100,000.]

City or Town.	Source.	Color.	Residue on Evaporation.	Ammonia.			Chlorine.	Hardness.
				Free.	Albuminoid.			
					Total.	Suspended.		
Cambridge — *Con.*	Fresh Pond,	.27	7.25	.0056	.0230	.0054	.61	3.1
Cheshire,	Thunder Brook,	.02	8.22	.0019	.0049	.0003	.11	5.3
	Kitchen Brook,	.01	6.93	.0010	.0049	.0005	.09	4.9
Chester (Fire District).	Austin Brook Reservoir,	.08	4.45	.0006	.0092	.0022	.12	1.6
	Horn Pond,	.10	3.75	.0010	.0148	.0008	.12	1.6
Chicopee,	Morton Brook,	.06	4.27	.0024	.0056	.0012	.22	1 0
	Cooley Brook,	.60	4.33	.0060	.0120	.0022	.20	1.3
Clinton,	Tap in town,	.11	3.90	.0005	.0105	.0025	.20	1.2
Colrain (Griswoldville).	McClellan Reservoir,	.01	7.38	.0008	.0048	.0009	.17	5.1
Concord,	Nagog Pond,	.05	3.09	.0013	.0105	.0015	.35	1.0
Dalton (Fire District).	Egypt Brook Reservoir,	.19	4.85	.0006	.0087	.0013	.12	2.3
	Windsor Reservoir,	.35	4.97	.0055	.0168	.0027	.13	2.5
	Cady Brook,	.20	4.17	.0013	.0091	.0012	.16	1.9
Danvers,	Middleton Pond,	.53	4.48	.0053	.0196	.0036	.38	1.7
	Swan Pond,	.23	5.22	.0018	.0176	.0031	.33	2.0
Deerfield (South Deerfield Water Supply District).	Roaring Brook,	.03	6.97	.0002	.0053	.0002	.15	4.1
Egremont (South),	Goodale Brook,	.00	4.00	.0006	.0024	.0001	.11	2.4
Fall River,	North Watuppa Lake,	.18	4.08	.0022	.0162	.0034	.50	1.3
Falmouth,	Long Pond,	.06	3.98	.0008	.0090	.0010	1.01	0.7
Fitchburg,	Meetinghouse Pond,	.07	3.12	.0034	.0154	.0015	.18	0.8
	Scott Reservoir,	.12	2.99	.0081	.0120	.0025	.25	0.9
	Wachusett Lake,	.09	2.96	.0025	.0117	.0021	.18	0.7
	Falulah Brook,	.15	3.04	.0031	.0123	.0021	.18	0.7
	Ashby Reservoir,	.34	3.31	.0069	.0186	.0027	.18	0.6
Gardner,	Crystal Lake,	.07	5.04	.0018	.0149	.0015	.34	2.1
Gloucester,	Dike's Brook Reservoir,	.28	3.88	.0040	.0106	.0017	.68	0.5
	Wallace Reservoir,	.57	4.57	.0037	.0147	.0022	.79	0.4
	Haskell Brook Reservoir,	.19	3.75	.0025	.0087	.0012	.65	0.5
Great Barrington (Fire District).	East Mountain Reservoir,	.10	5.52	.0075	.0101	.0017	.11	3.0
	Green River,	.00	9.30	.0011	.0045	.0002	.10	6.6
Great Barrington (Housatonic).	Long Pond,	.04	7.05	.0019	.0169	.0013	.20	5.9
Greenfield (Fire District No. 1).	Glen Brook Upper Reservoir,	.03	6.52	.0040	.0068	.0011	.23	2.6
	Glen Brook Lower Reservoir,	.02	5.77	.0023	.0089	.0015	.17	3.6

Averages of Chemical Analyses of Surface-water Sources, etc. — Continued.

[Parts in 100,000.]

City or Town.	Source.	Color.	Residue on Evaporation.	Ammonia.			Chlorine.	Hardness.
				Free.	Albuminoid.			
					Total.	Suspended.		
Hadley (Water Supply District).	Hart's Brook Reservoir,	.04	5.37	.0024	.0133	.0026	.23	2.5
Hatfield,	Running Gutter Brook Reservoir,	.06	5.60	.0017	.0057	.0008	.23	2.5
Haverhill,	Johnson's Pond,	.21	5.46	.0022	.0169	.0018	.44	2.5
	Crystal Lake,	.17	3.87	.0012	.0146	.0016	.33	1.4
	Kenoza Lake,	.20	5.00	.0017	.0155	.0019	.42	2.4
	Lake Saltonstall,	.07	6.81	.0028	.0168	.0028	.62	2.7
	Pentucket Lake,	.15	4.38	.0011	.0148	.0024	.38	2.1
	Millvale Reservoir,	.61	5.45	.0034	.0178	.0019	.35	2.0
Hingham,	Accord Pond,	.19	3.22	.0022	.0122	.0013	.45	0.6
	Fulling Mill Pond,	.67	5.71	.0091	.0275	.0094	.69	1.5
Hinsdale (Fire District).	Reservoir,	.15	2.95	.0007	.0093	.0014	.12	0.4
Holyoke,	Whiting Street Reservoir,	.08	5.01	.0033	.0115	.0014	.21	2.9
	Fomer Reservoir,	.35	4.19	.0017	.0118	.0019	.16	1.4
	Wright and Ashley Pond,	.08	5.36	.0045	.0149	.0025	.18	3.0
	High Service Reservoir,	.08	4.27	.0038	.0146	.0024	.19	2.0
	White Reservoir,	.26	3.67	.0052	.0184	.0062	.17	1.4
Hudson,	Gates Pond,	.07	3.59	.0034	.0180	.0035	.24	1.6
Huntington (Fire District).	Cold Brook Reservoir,	.13	3.22	.0012	.0061	.0008	.14	1.3
Ipswich,	Dow's Brook Reservoir,	.32	5.04	.0048	.0159	.0020	.63	1.8
Lawrence,	Merrimack River, filtered,	.40	6.24	.0062	.0081	–	.47	1.2
Lee,	Codding Brook Upper Reservoir,	.10	4.32	.0027	.0090	.0015	.12	2.3
	Codding Brook Lower Reservoir,	.09	4.31	.0022	.0070	.0007	.13	2.1
	Basin Pond Brook,	.59	4.55	.0030	.0170	.0014	.12	1.6
Lenox,	Reservoir,	.04	7.70	.0003	.0068	.0014	.09	6.1
	Laurel Lake,	.10	13.40	.0033	.0140	.0032	.18	13.2
Leominster,	Morse Reservoir,	.16	2.65	.0017	.0119	.0619	.17	0.5
	Haynes Reservoir,	.20	2.52	.0050	.0205	.0040	.17	0.4
	Fall Brook Reservoir,	.11	2.65	.0027	.0117	.0016	.20	0.5
Lincoln,	Sandy Pond,	.09	3.72	.0048	.0117	.0015	.36	1.4
Longmeadow,	Cooley Brook,	.05	5.22	.0050	.0083	.0015	.23	2.6
Lynn,	Birch Reservoir,	.16	4.76	.0056	.0176	.0045	.59	1.6
	Breed's Reservoir,	.33	4.73	.0052	.0172	.0024	.56	1.6
	Walden Reservoir,	.39	4.51	.0048	.0172	.0029	.50	1.5

Averages of Chemical Analyses of Surface-water Sources, etc. — Continued.

[Parts in 100,000.]

City or Town.	Source.	Color.	Residue on Evaporation.	Ammonia.			Chlorine.	Hardness.
				Free.	Albuminoid.			
					Total.	Suspended.		
Lynn—*Con.*	Hawkes Reservoir,	.36	5.71	.0067	.0214	.0038	.59	2.2
Manchester,	Gravel Pond,	.13	4.39	.0020	.0129	.0026	.74	1.1
Marlborough,	Lake Williams,	.18	5.72	.0056	.0191	.0026	.47	2.0
	Milham Brook Reservoir,	.35	4.99	.0049	.0170	.0024	.41	1.8
Maynard,	White Pond,	.08	3.14	.0018	.0128	.0022	.27	0.7
Milford,	Charles River, filtered,	.18	6.93	.0015	.0071	–	.31	4.0
Montague,[1]	Lake Pleasant,	.06	3.70	.0034	.0090	.0013	.17	0.9
Nantucket,	Wannacomet Pond,	.15	6.86	.0060	.0203	.0056	2.06	1.6
New Bedford,	Little Quittacas Pond,	.49	3.90	.0034	.0177	.0017	.49	0.8
	Great Quittacas Pond,	.69	4.04	.0045	.0201	.0035	.47	0.9
Newburyport,	Artichoke River,	.36	7.51	.0155	.0303	.0052	.62	2.8
North Adams,	Notch Brook Reservoir,	.03	6.85	.0009	.0055	.0009	.09	5.1
	Beaman Reservoir,	.02	6.68	.0019	.0081	.0012	.10	4.8
Northampton,	Middle Reservoir,	.22	4.18	.0026	.0115	.0021	.16	1.7
	Mountain Street Reservoir,	.14	4.09	.0021	.0073	.0011	.13	1.8
North Andover,	Great Pond,	.11	4.77	.0041	.0139	.0017	.44	1.9
Northborough,	Lower Reservoir,	.58	4.44	.0041	.0178	.0022	.24	1.3
	Upper Reservoir,	.69	4.40	.0034	.0185	.0027	.25	1.3
Northbridge,	Cook Allen Reservoir,	.02	2.99	.0017	.0059	.0013	.21	0.8
North Brookfield,	Doane Pond,	.40	3.58	.0052	.0219	.0044	.17	0.7
	North Pond,	.41	3.67	.0042	.0249	.0059	.19	0.8
Northfield,	Reservoir,	.14	3.12	.0005	.0064	.0006	.16	1.0
Norwood,	Buckmaster Pond,	.16	4.30	.0074	.0162	.0032	.47	1.6
	Outlet of filter,	.08	3.57	.0012	.0082	–	.48	1.5
Orange,	Reservoir,	.07	3.92	.0006	.0045	.0007	.13	0.9
Palmer (Fire District No. 1).	Lower Reservoir,	.28	4.02	.0039	.0139	.0021	.25	1.4
Peabody,	Spring Pond,	.26	6.48	.0062	.0158	.0029	.68	2.0
	Suntaug Lake,	.07	5.49	.0049	.0192	.0057	.98	2.5
Pittsfield,	Ashley Lake,	.16	4.50	.0036	.0142	.0025	.15	1.8
	Ashley Brook,	.20	6.34	.0043	.0130	.0017	.14	3.8
	Hathaway Brook,	.01	8.97	.0012	.0044	.0004	.13	7.7

[1] Supply for Turner's Falls Fire District, Millers Falls Water Supply District and Lake Pleasant Water Supply District.

Averages of Chemical Analyses of Surface-water Sources, etc. — Continued.

[Parts in 100,000.]

City or Town.	Source.	Color.	Residue on Evaporation.	Ammonia.			Chlorine.	Hardness.
				Free.	Albuminoid.			
					Total.	Suspended.		
Pittsfield — *Con.*	Mill Brook,	.29	4.17	.0022	.0112	.0011	.08	2.1
	Sacket Brook,	.01	9.54	.0004	.0036	.0001	.12	7.8
	Farnham Reservoir,	.48	4.22	.0027	.0177	.0025	.09	1.6
Plymouth,	Little South Pond,	.00	2.97	.0037	.0136	.0023	.59	0.5
	Great South Pond,	.00	2.78	.0028	.0132	.0022	.67	0.4
Randolph,	Great Pond,	.41	4.68	.0017	.0157	.0017	.51	1.3
Rockport,	Cape Pond,	.29	9.91	.0058	.0191	.0033	3.47	1.8
Russell,	Black Brook,	.46	4.65	.0015	.0152	.0021	.11	1.5
Rutland,	Muschopauge Lake,	.05	3.55	.0006	.0095	.0011	.32	1.2
Salem,	Wenham Lake,	.27	6.98	.0088	.0195	.0043	.81	2.5
	Longham Reservoir,	1.24	9.35	.0184	.0361	.0076	1.12	2.5
	Ipswich River at pumping station.	.56	11.29	.0135	.0243	.0068	.81	5.2
Shelburne (Shelburne Falls Fire District).	Fox Brook,	.02	6.02	.0002	.0038	.0001	.15	3.0
Southbridge,	Hatchet Brook Reservoir No. 3,	.16	3.37	.0029	.0143	.0018	.16	0.8
	Hatchet Brook Reservoir No. 4,	.16	3.21	.0028	.0134	.0026	.16	0.9
South Hadley (Fire District No. 1).	Leaping Well Reservoir,	.07	3.33	.0013	.0132	.0044	.20	0.9
	Buttery Brook Reservoir,	.19	4.96	.0036	.0094	.0017	.33	1.4
Spencer,	Shaw Pond,	.05	2.54	.0013	.0115	.0012	.18	0.7
Springfield,	Westfield Little River, filtered,	.16	3.24	.0006	.0070	–	.16	1.4
Stockbridge,	Lake Averic,	.09	6.86	.0014	.0128	.0014	.14	4.8
Stoughton,	Muddy Pond Brook,	.17	3.67	.0007	.0081	.0016	.40	1.0
Taunton,	Assawompsett Pond,	.39	3.80	.0032	.0162	.0023	.41	0.6
	Elder's Pond,	.18	3.67	.0028	.0148	.0017	.46	0.8
Wakefield,	Crystal Lake,	.17	6.06	.0072	.0194	.0036	.79	2.3
Wareham (Onset),	Jonathan Pond,	.05	2.67	.0011	.0095	.0013	.58	0.4
Wayland,	Snake Brook Reservoir,	.74	5.36	.0092	.0244	.0037	.37	1.6
Westfield,	Montgomery Reservoir,	.33	3.49	.0018	.0117	.0023	.15	0.7
	Tillotson Brook Reservoir,	.09	3.16	.0012	.0051	.0002	.14	0.8
West Springfield,	Bear Hole Brook,	.13	7.73	.0044	.0092	.0011	.21	4.1
	Bear Hole Brook, filtered,	.02	7.18	.0008	.0051	–	.23	4.0
Weymouth,	Great Pond,	1.01	5.10	.0073	.0224	.0018	.44	0.8
Williamsburg,	Reservoir,	.12	4.63	.0004	.0077	.0015	.15	2.3

Averages of Chemical Analyses of Surface-water Sources, etc. — Concluded.

[Parts in 100,000.]

City or Town.	Source.	Color.	Residue on Evaporation.	Ammonia.			Chlorine.	Hardness.
				Free.	Albuminoid.			
					Total.	Suspended.		
Williamstown,	Reservoirs,	.03	7.75	.0008	.0048	.0005	.11	6.0
Winchester,	North Reservoir,	.06	4.00	.0034	.0133	.0016	.37	1.7
	South Reservoir,	.06	3.76	.0034	.0136	.0021	.36	1.6
	Middle Reservoir,	.16	4.07	.0069	.0226	.0042	.35	1.7
Worcester,	Bottomly Reservoir,	.23	3.52	.0025	.0146	.0012	.18	1.3
	Kent Reservoir,	.20	3.52	.0012	.0149	.0041	.17	1.4
	Leicester Reservoir,	.34	3.40	.0032	.0157	.0029	.19	1.3
	Mann Reservoir,	.22	3.67	.0023	.0153	.0028	.16	1.7
	Upper Holden Reservoir,	.12	3.71	.0010	.0105	.0020	.21	1.0
	Lower Holden Reservoir,	.10	3.31	.0017	.0108	.0019	.19	0.9
	Kendall Reservoir,	.09	3.10	.0015	.0119	.0019	.19	1.1

Averages of Chemical Analyses of Ground-water Sources for the Year 1920.

[Parts in 100,000.]

City or Town.	Source.	Color.	Residue on Evaporation.	Ammonia.		Chlorine.	Nitrogen as —		Hardness.	Iron.
				Free.	Albuminoid.		Nitrates.	Nitrites.		
Acton (West and South Water Supply District).	Tubular wells,	.00	8.15	.0004	.0024	.65	.0940	.0000	3.5	.008
Adams (Fire District).	Tubular wells,	.00	13.65	.0003	.0014	.18	.3320	.0000	10.6	.006
Amesbury,	Tubular wells,	.36	14.68	.0047	.0039	.52	.0075	.0001	7.2	.295
Ashland,	Tubular wells, old supply,	.01	6.65	.0002	.0019	.64	.0057	.0000	2.1	.022
	Tubular wells, new supply,	.00	5.92	.0006	.0033	.39	.0054	.0001	2.1	.016
Attleboro,	Large well,	.01	4.82	.0003	.0048	.48	.0105	.0000	2.1	.009
Avon,	Wells,	.00	7.84	.0010	.0030	.55	.2420	.0001	2.9	.010
Ayer,	Large well,	.00	6.80	.0005	.0021	.60	.0580	.0001	3.0	.015
	Tubular wells,	.00	6.43	.0011	.0043	.33	.0113	.0001	3.1	.020
Barnstable,	Tubular wells,	.00	4.30	.0007	.0017	1.11	.0043	.0000	1.0	.023
Bedford,	Large well,	.00	4.23	.0005	.0023	.31	.0060	.0000	2.1	.015
Billerica,	Old wells,	.07	11.48	.0014	.0060	.42	.0105	.0000	4.5	.176

Averages of Chemical Analyses of Ground-water Sources, etc. — Continued.

[Parts in 100,000.]

City or Town.	Source.	Color.	Residue on Evaporation.	Ammonia.		Chlorine.	Nitrogen as —		Hardness.	Iron.
				Free.	Albuminoid.		Nitrates.	Nitrites.		
Billerica — *Con.*	New wells,	.14	6.88	.0012	.0060	.45	.0135	.0000	2.9	.040
Braintree,	Filter-gallery,	.28	6.93	.0020	.0117	.74	.1233	.0000	2.5	.017
Bridgewater,	Wells,	.00	4.72	.0003	.0018	.59	.0288	.0000	1.4	.015
Brookfield (East),	Tubular wells,	.00	2.80	.0000	.0018	.30	.0030	.0001	0.2	.005
Brookline,	Tubular wells and filter-gallery, filtered.	.11	9.04	.0006	.0063	.76	.0266	.0000	3.9	.012
Canton,	Springdale well,	.02	4.67	.0003	.0022	.50	.0230	.0001	1.9	.010
	Well near Henry's Spring,	.07	4.72	.0005	.0035	.50	.0252	.0000	1.8	.017
Chelmsford (North Chelmsford Fire District).	Tubular wells,	.06	6.35	.0088	.0064	.59	.1137	.0004	2.6	.016
Chelmsford (Water District).	Tubular wells,	.00	8.00	.0003	.0014	.65	.1263	.0010	3.0	.018
Chicopee (Fairview).	Tubular wells,	.02	5.49	.0007	.0024	.28	.0634	.0000	2.0	.038
Cohasset,	Tubular wells,	.09	12.99	.0008	.0072	1.81	.1386	.0000	5.2	.011
	Filter-gallery,	.33	11.00	.0017	.0149	1.34	.0520	.0000	3.9	.055
	Dug well, filtered,	.11	8.14	.0026	.0074	1.08	.0069	.0001	2.9	.025
Dedham,	Large well and tubular wells.	.07	10.43	.0021	.0045	1.08	.1483	.0002	4.2	.016
Deerfield (Fire District).	Wells,	.01	4.45	.0004	.0039	.20	.0100	.0000	2.0	.012
Douglas,	Tubular wells,	.02	6.30	.0005	.0022	.41	.0505	.0000	2.0	.024
Dracut (Water Supply District).	Tubular wells,	.00	9.00	.0004	.0024	.70	.1200	.0001	3.8	.006
Dracut (Collinsville).	Tubular wells,	.00	4.70	.0005	.0022	.30	.0050	.0000	1.6	.027
Dudley,	Tubular wells,	.00	3.13	.0002	.0014	.23	.0093	.0000	1.4	.010
Duxbury (Fire and Water District).	Tubular wells,	.00	4.50	.0003	.0021	.71	.0123	.0000	0.7	.020
Easthampton,	Tubular wells,	.00	8.17	.0002	.0014	.20	.0173	.0001	3.7	.012
Easton (North Easton Village District).	Well,	.00	5.03	.0003	.0023	.46	.0469	.0000	2.1	.008
Edgartown,	Large well,	.00	3.20	.0004	.0020	.98	.0045	.0000	0.7	.010
Fairhaven,	Tubular wells,	.29	9.07	.0022	.0081	.86	.1320	.0005	2.8	.037
Foxborough (Water Supply District).	Tubular wells,	.00	5.15	.0008	.0029	.53	.0530	.0000	1.5	.018
Framingham,	Filter-gallery,	.00	12.53	.0154	.0069	2.05	.0148	.0008	5.6	.010
Franklin,	Tubular wells,	.00	5.30	.0006	.0028	.61	.0240	.0000	1.8	.010
Grafton,	Filter-gallery,	.04	11.82	.0004	.0050	1.41	.1750	.0001	4.5	.015
Granville,	Well,	.05	4.18	.0002	.0019	.10	.0083	.0001	2.0	.069
Groton,	Large well,	.01	6.43	.0004	.0026	.25	.0040	.0000	3.0	.013
Groton (West Groton Water Supply District).	Tubular wells,	.00	4.90	.0002	.0017	.17	.0077	.0000	2.8	.010
Hingham,	Wells,	.10	5.25	.0026	.0051	.66	.0152	.0001	1.8	.020

Averages of Chemical Analyses of Ground-water Sources, etc. — Continued.

[Parts in 100,000.]

City or Town.	Source.	Color.	Residue on Evaporation.	Ammonia.		Chlorine.	Nitrogen as —		Hardness.	Iron.
				Free.	Albuminoid.		Nitrates.	Nitrites.		
Holliston,	Large well,	.38	4.23	.0078	.0147	.40	–	–	1.7	.031
Hopkinton,	Tubular wells,	.00	10.75	.0004	.0025	.71	.1600	.0000	4.7	.022
Huntington (Fire District).	Tubular wells,	.00	5.75	.0005	.0020	.24	–	–	2.4	.010
Kingston,	Tubular wells,	.00	5. 5	.0006	.0017	.77	.0090	.0000	1.3	.015
Leicester (Water Supply District).	Wells,	.08	5.70	.0003	.0028	.30	.0807	.0000	2.0	.012
Leicester (Cherry Valley and Rochdale Water District).	Wells,	.19	4.28	.0027	.0123	.31	–	–	2.0	.013
Littleton,	Tubular wells,	.00	3.90	.0002	.0019	.24	.0103	.0000	1.8	.008
Lowell,	Boulevard wells (tubular),	.43	6.87	.0447	.0064	.51	.0192	.0003	3.0	.356
	Boulevard wells, filtered,	.05	5.73	.0007	.0035	.50	.0351	.0000	2.6	.021
Manchester,	Wells,	.00	12.22	.0005	.0018	1.95	.1400	.0000	4.1	.025
Mansfield (Water Supply District).	Large well,	.00	4.87	.0003	.0014	.35	.1027	.0000	1.8	.007
Marblehead,	Inlet of filter,	.31	16.03	.0146	.0105	1.76	.0094	.0001	6.3	.228
	Outlet of filter,	.13	13.58	.0004	.0066	1.61	.0107	.0000	6.1	.017
	Wells,	.14	15.33	.0014	.0064	2.13	.0117	.0001	6.0	.040
Marion,	Tubular wells,	.00	4.93	.0003	.0013	.65	.0287	.0001	1.5	.013
Marshfield,	Wells,	.00	12.00	.0008	.0022	3.60	.0920	.0000	3.1	.010
Mattapoisett,	Tubular wells,	.00	5.63	.0002	.0017	.80	.0407	.0000	2.2	.009
Medfield,	Spring,	.00	3.67	.0002	.0021	.32	.0083	.0000	1.5	.013
Medway,	Wells,	.00	6.79	.0008	.0020	.57	.0327	.0001	2.7	.007
Merrimac,	Tubular wells,	.00	8.08	.0006	.0018	.51	.0150	.0001	3.3	.017
Methuen,	Tubular wells,	.32	7.75	.0023	.0090	.50	.0148	.0000	3.1	.073
Middleborough (Fire District).	Well,	.28	7.23	.0092	.0058	.58	.0277	.0001	2.5	.335
	Filtered water,	.12	5.92	.0006	.0044	.58	.0283	.0000	2.2	.043
Millbury,	Well,	.00	4.50	.0007	.0026	.33	.0147	.0000	1.9	.013
Millis,	Spring,	.00	10.50	.0003	.0018	.84	.2833	.0001	4.6	.011
Monson,	Large well,	.05	3.43	.0003	.0023	.19	.0073	.0000	1.5	.011
Nantucket,	Wells in Wyers Valley,	.04	4.32	.0043	.0077	1.32	.0050	.0000	0.9	.050
Natick,	Large well,	.00	10.08	.0006	.0032	.84	.0333	.0000	5.0	.010
Needham,	Wells,	.01	6.10	.0007	.0022	.64	.0760	.0004	3.0	.024
	Hicks Spring,	.00	7.72	.0007	.0032	.83	.2667	.0000	2.7	.007
Newburyport,	Wells and Artichoke River, filtered.	.16	6.84	.0010	.0091	.71	.0207	.0000	2.9	.044
Newton,	Tubular wells and filter-gallery.	.04	6.61	.0011	.0047	.44	.0268	.0001	2.6	.016

Averages of Chemical Analyses of Ground-water Sources, etc. — Continued.

[Parts in 100,000.]

City or Town.	Source.	Color.	Residue on Evaporation.	Ammonia.		Chlorine.	Nitrogen as —		Hardness.	Iron.
				Free.	Albuminoid.		Nitrates.	Nitrites.		
No. Attleborough,	Wells,	.00	4.62	.0005	.0624	.55	.0140	.0001	2.1	.013
Norton,	Tubular wells,	.00	4.73	.0005	.0021	.42	.0057	.0001	1.4	.015
Norwood,	Tubular wells,	.15	8.52	.0021	.0064	.56	.0400	.0001	3.7	.161
Oak Bluffs,	Springs,	.00	4.30	.0005	.0022	1.01	.0060	.0001	0.7	.012
Oxford,	Tubular wells,	.00	5.23	.0001	.0021	.36	.0353	.0000	1.8	.010
Palmer (Bondsville),	Tubular wells,	.00	5.70	.0006	.0015	.27	.0160	.0000	2.6	.012
Pepperell,	Tubular wells,	.00	4.05	.0000	.0014	.20	.0040	.0000	1.5	.017
Provincetown,	Tubular wells,	.01	16.42	.0005	.0017	7.42	.0048	.0000	4.4	.025
Reading,	Filter-gallery,	.54	9.25	.0147	.0149	1.35	.0100	.0000	2.2	.235
	Filtered water,	.19	16.60	.0006	.0050	.99	.0072	.0003	7.1	.065
Salisbury,	Well,	.19	9.48	.0008	.0034	.61	.0067	.0000	4.2	.059
Scituate,	Tubular wells,	.00	14.32	.0001	.0014	2.99	.1660	.0001	4.9	.009
Sharon,	Well,	.00	13.77	.0003	.0020	2.11	.2633	.0001	6.0	.007
	Tubular wells,	.03	5.00	.0004	.0015	.47	.0230	.0001	2.0	.020
Sheffield,	Spring,	.00	4.23	.0000	.0010	.12	.0093	.0000	1.7	.005
Shirley (Shirley Village Water District).	Well,	.00	4.27	.0001	.0012	.40	.0930	.0000	1.3	.012
Shrewsbury,	Tubular wells,	.00	5.42	.0002	.0020	.49	.0310	.0000	1.9	.010
South Hadley (Fire District No. 2).	Large well,	.00	5.50	.0004	.0014	.19	.0320	.0002	1.6	.005
Tisbury,	Well,	.00	3.90	.0000	.0016	1.01	.0070	.0000	0.8	.004
Uxbridge,	Tubular wells,	.00	5.20	.0001	.0020	.55	.0680	.0000	1.9	.007
Walpole,	Tubular wells,	.00	4.80	.0003	.0014	.48	.0233	.0000	1.8	.018
Waltham,	Old well,	.15	8.95	.0046	.0037	.78	.0154	.0000	4.2	.066
	New well,	.00	7.45	.0006	.0036	.57	.0142	.0000	3.7	.010
Ware,	Wells,	.00	7.57	.0002	.0015	.56	.1750	.0001	2.9	.016
Wareham (Fire District).	Tubular wells,	.00	3.55	.0002	.0008	.63	.0030	.0000	0.7	.007
Webster,	Wells,	.00	4.03	.0003	.0018	.34	.0133	.0000	2.0	.014
Wellesley,	Tubular wells,	.00	10.38	.0020	.0023	1.15	.0883	.0000	4.3	.017
	Well at Williams Spring,	.22	17.70	.0015	.0029	1.37	.6900	.0001	6.0	.014
	Filter-gallery,	.00	8.75	.0017	.0037	.99	.1007	.0000	4.3	.009
Westborough,	Filter basin,	.00	3.30	.0018	.0079	.29	–	–	0.9	.016
West Brookfield,	Tubular wells,	.00	5.53	.0004	.0015	.29	.0713	.0000	1.2	.010
Westford,	Tubular wells,	.00	4.65	.0002	.0017	.19	.0075	.0000	2.3	.005

Averages of Chemical Analyses of Ground-water Sources, etc. — Concluded.

[Parts in 100,000.]

City or Town.	Source.	Color.	Residue on Evaporation.	Ammonia.		Chlorine.	Nitrogen as —		Hardness.	Iron.
				Free.	Albuminoid.		Nitrates.	Nitrites.		
Weston,	Well,	.26	7.05	.0007	.0079	.52	.0120	.0000	2.7	.015
Winchendon,	Old well,	.11	4.20	.0017	.0024	.18	.0073	.0000	1.1	.118
	New well,	.01	3.22	.0009	.0024	.16	.0065	.0000	1.1	.007
Woburn,	Filter-gallery,	.00	11.53	.0006	.0047	1.36	.0370	.0000	5.3	.008
Worthington (Fire District).	Springs,	.01	2.77	.0004	.0033	.13	.0080	.0000	1.5	.026
Wrentham,	Tubular wells,	.00	4.25	.0001	.0014	.32	.0210	.0000	1.4	.007

Comparison of Water Supplies of the State by Chemical Analysis.

A comparison of the different water supplies of the State by chemical analysis furnishes much information of interest and value as to the general characteristics of the supplies now in use. In most places the supplies are satisfactory, and those which are least desirable have not yet become sufficiently unsatisfactory, at least from the consumer's point of view, to lead to a change.

A comparison of the physical characteristics of the various sources of water supply of the State shows wide differences in the characteristics of waters which are in daily use often in adjacent communities. All waters, whether from lakes, ponds and streams or from springs or wells, have a common origin in the rainfall, yet there are such essential differences in character between surface waters and ground waters that in any attempt to compare the water supplies of the State it is important to consider these two classes separately. The waters of running streams under normal conditions contain but little organic life. Streams which drain swamps and areas of meadow lands, in which much of the water is in contact for considerable periods with decaying vegetation, grasses, leaves, soil and other organic matter, are often highly colored and contain a great amount of organic matter, commonly, however, carried for the most part in solution, so that these waters, though highly colored, are often nearly or quite clear. In the winter, and especially in the spring, the waters of the streams are made up very largely of rain and melting snow, and the color and

organic matter are less than at other seasons. In hilly or mountainous regions or in valleys where the soil is composed largely of sand and gravel, surface waters are often clear and colorless and especially in the drier part of the year contain but little organic matter and differ but little from ground waters of which, in fact, they largely consist. Ground waters, that is the waters of springs, wells and filter galleries, are usually clear, colorless and free from odor and contain little or no organic matter, though they may contain greater or less amounts of mineral matter, depending upon the character of the soil and rocks over which they pass. While most ground waters are clear, colorless and practically free from organic or suspended matter, some of them are affected by excessive quantities of iron or manganese, and, though they may be clear and colorless when drawn from the ground, quickly become turbid and colored, due to the oxidation of the mineral matter they contain which accumulates in the form of a sediment. The storage of water in ponds and reservoirs affords conditions favorable to the growth of vegetable and animal organisms which, in some of the ponds and in reservoirs not properly prepared for the storage of water, at times develop to such an extent as to give the water a decided turbidity and an objectionable taste and odor. In some parts of the State, chiefly in Berkshire County, the waters are affected by an excessive amount of mineral matter due to limestone.

In the following tables are presented the analyses of all of the surface and ground water supplies in use in the State, including possible auxiliaries, which were examined during the five years from 1915 to 1919, inclusive. In the case of most of these waters the figures represent averages of from 30 to 60 analyses made at regular intervals of one or two months. In a few cases the samples have been fewer and represent longer intervals, but in all as often as once in three months, and in a few other cases samples have been collected at intervals of two weeks or even less. The use of some of these sources was begun subsequent to 1915, and the examinations consequently cover a shorter period than the five years mentioned, but these cases are indicated by footnotes.

Surface Water Sources.

Averages of Chemical Analyses from 1915 to 1919, inclusive.

[Parts in 100,000.]

City or Town.	Source.	Color.	Residue on Evaporation.	Ammonia.			Chlorine.	Hardness.
				Free.	Albuminoid.			
					Total.	Suspended.		
Metropolitan Water District.	Wachusett Reservoir, upper end,	.30	3.80	.0023	.0155	.0024	.29	1.1
	Wachusett Reservoir, lower end,	.14	3.30	.0023	.0128	.0019	.29	1.0
	Sudbury Reservoir, . . .	.17	3.87	.0028	.0158	.0029	.33	1.3
	Framingham Reservoir No. 3, .	.17	3.81	.0036	.0171	.0034	.34	1.3
	Hopkinton Reservoir, . .	.63	4.37	.0031	.0223	.0026	.39	1.2
	Ashland Reservoir, . . .	.64	4.57	.0032	.0248	.0029	.36	1.3
	Framingham Reservoir No. 2, .	.79	5.30	.0055	.0275	.0035	.46	1.4
	Lake Cochituate, . . .	.20	6.44	.0045	.0249	.0058	.70	2.5
	Chestnut Hill Reservoir, . .	.17	3.79	.0023	.0149	.0027	.34	1.4
	Weston Reservoir, . . .	.16	3.87	.0026	.0155	.0027	.33	1.3
	Spot Pond, ...	.08	3.78	.0021	.0160	.0027	.36	1.4
	Tap in State House, . . .	.17	4.16	.0015	.0144	.0023	.35	1.4
	Tap in Revere, ...	.09	3.84	.0014	.0140	.0019	.35	1.4
	Tap in Quincy, ...	.15	3.89	.0010	.0121	.0015	.36	1.4
Abington, . .	Big Sandy Pond, . . .	.09	3.74	.0032	.0149	.0021	.73	0.9
Adams (Fire District).	Bassett Brook, ...	.02	4.01	.0016	.0048	.0007	.11	2.4
	Dry Brook, ...	.22	6.80	.0021	.0109	.0016	.13	4.9
Amherst, . .	Amethyst Brook small reservoir,	.21	3.40	.0037	.0128	.0025	.18	0.7
	Amethyst Brook large reservoir,	.49	3.72	.0026	.0152	.0029	.17	0.8
Andover, . .	Haggett's Pond, ...	.15	4.25	.0031	.0180	.0026	.39	1.5
Ashburnham, .	Upper Naukeag Lake, . .	.07	2.52	.0013	.0090	.0010	.16	0.5
Ashfield, . .	Bear Swamp Brook, . . .	.30	5.54	.0025	.0125	.0013	.14	2.7
Athol, . . .	Phillipston Reservoir, . .	.61	4.32	.0115	.0377	.0123	.20	1.0
	Buckman Brook Reservoir, .	.25	3.56	.0057	.0224	.0065	.15	0.8
	Inlet of filter, ...	.53	4.33	.0074	.0273	.0068	.16	1.1
	Outlet of filter, ...	.49	4.42	.0051	.0213	–	.17	1.2
Barre, . . .	Reservoir, ...	.16	3.83	.0049	.0184	.0033	.22	1.3
Blandford (Fire District).	Freeland Brook, ...	.07	3.56	.0005	.0047	.0005	.21	1.4
Brockton, . .	Silver Lake, ...	.11	3.48	.0029	.0140	.0030	.64	0.8
Cambridge, . .	Lower Hobbs Brook Reservoir, .	.16	6.39	.0054	.0252	.0037	.51	2.5
	Stony Brook Reservoir, . .	.45	6.73	.0049	.0259	.0042	.59	2.5

Averages of Chemical Analyses from 1915 to 1919, inclusive — Continued.

[Parts in 100,000.]

City or Town.	Source.	Color.	Residue on Evaporation.	Ammonia.			Chlorine.	Hardness.
				Free.	Albuminoid.			
					Total.	Suspended.		
Cambridge—*Con.*	Fresh Pond,	.27	6.94	.0092	.0289	.0084	.65	2.9
Cheshire,	Thunder Brook,	.01	6.87	.0006	.0044	.0006	.12	5.8
	Kitchen Brook,	.01	6.04	.0010	.0041	.0005	.11	4.7
Chester (Fire District).	Austin Brook Reservoir,	.11	3.78	.0023	.0141	.0034	.15	1.7[1]
Chicopee,	Cooley Brook,	.56	4.28	.0055	.0159	.0037	.17	1.3
	Morton Brook,	.07	4.05	.0012	.0051	.0008	.17	1.0
Colrain (Griswoldville).	McClellan Reservoir,	.05	7.02	.0031	.0078	.0007	.14	4.3
Concord,	Nagog Pond,	.06	2.79	.0021	.0137	.0015	.37	0.8
Dalton (Fire District).	Egypt Brook Reservoir,	.26	3.25	.0028	.0126	.0022	.12	1.5
	Cady Brook,	.30	4.73	.0014	.0134	.0012	.11	2.2
Danvers,	Middleton Pond,	.53	5.39	.0034	.0230	.0030	.44	1.8
Deerfield (South Deerfield Water Supply District).	Roaring Brook,	.10	6.54	.0011	.0061	.0008	.17	5.7
Egremont (South),	Goodale Brook,	.02	4.52	.0003	.0029	.0002	.12	2.6
Fall River,	North Watuppa Lake,	.15	4.32	.0028	.0193	.0032	.63	1.0
Falmouth,	Long Pond,	.01	3.71	.0024	.0120	.0015	1.04	0.4
Fitchburg,	Meetinghouse Pond,	.09	3.11	.0050	.0165	.0023	.20	1.0
	Scott Reservoir,	.14	3.17	.0075	.0182	.0046	.23	0.7
	Wachusett Lake,	.10	2.88	.0051	.0163	.0025	.19	0.8
	Falulah Brook,	.22	3.27	.0057	.0168	.0035	.21	0.6
	Ashby Reservoir,	.65	3.84	.0165	.0304	.0062	.20	0.7[1]
Gardner,	Crystal Lake,	.09	4.73	.0026	.0156	.0027	.31	1.9
Gloucester,	Dike's Brook Reservoir,	.32	4.12	.0039	.0164	.0023	.84	0.4
	Wallace Reservoir,	.52	4.69	.0039	.0216	.0049	.97	0.5
	Haskell Brook Reservoir,	.27	4.25	.0025	.0142	.0027	.86	0.5
Great Barrington (Fire District).	East Mountain Reservoir,	.12	5.87	.0061	.0120	.0027	.13	3.7
	Green River,	.00	10.00	.0012	.0043	.0005	.14	7.9[1]
Great Barrington (Housatonic).	Long Pond,	.07	8.83	.0044	.0201	.0027	.14	6.2
Greenfield Fire District No. 1).	Glen Brook Lower Reservoir,	.03	5.52	.0024	.0078	.0016	.17	3.2
Hadley (Water Supply District).	Hart's Brook Reservoir,	.08	4.30	.0015	.0058	.0010	.19	1.9[1]
Hatfield,	Running Gutter Brook Reservoir,	.10	4.79	.0029	.0071	.0010	.21	2.3
Haverhill,	Johnson's Pond,	.16	5.27	.0025	.0192	.0020	.50	2.3
	Crystal Lake,	.19	4.06	.0026	.0208	.0033	.38	1.4

[1] Average of four years.

Averages of Chemical Analyses from 1915 to 1919, inclusive — Continued.

[Parts in 100,000.]

City or Town.	Source.	Color.	Residue on Evaporation.	Ammonia.			Chlorine.	Hardness.
				Free.	Albuminoid.			
					Total.	Suspended.		
Haverhill—*Con.*	Kenoza Lake,	.20	5.23	.0027	.0267	.0030	.46	2.2
	Lake Saltonstall,	.10	6.59	.0048	.0193	0029	.65	3.0
	Pentucket Lake,	.17	5.26	.0029	.0205	.0035	.49	2.2
	Millvale Reservoir,	.59	6.21	.0042	.0246	.0044	.40	2.3
Hingham,	Accord Pond,	.23	3.93	.0024	.0162	.0024	.66	0.7
Hinsdale (Fire District).	Reservoir,	.22	2.70	.0040	.0136	.0023	.10	0.7
Holyoke,	Whiting Street Reservoir,	.09	5.02	.0048	.0161	.0025	.22	2.6
	Fomer Reservoir,	.33	4.19	.0031	.0145	.0024	.16	1.4
	Wright and Ashley Pond,	.12	5.33	.0048	.0173	.0031	.18	2.6
	High Service Reservoir,	.12	4.26	.0055	.0193	.0032	.19	1.7
	White Reservoir,	.26	3.90	.0085	.0203	.0047	.15	1.5
Hudson,	Gates Pond,	.08	3.63	.0034	.0178	.0030	.27	1.5
Huntington (Fire District).	Cold Brook Reservoir,	.17	3.08	.0006	.0073	.0009	.15	1.3[1]
Ipswich,	Dow's Brook Reservoir,	.29	5.87	.0041	.0197	.0031	.80	2.0
Lawrence,	Merrimack River, filtered,	.34	5.91	.0051	.0082	–	.45	1.4
Lee,	Codding Brook Upper Reservoir,	.13	4.51	.0028	.0087	.0010	.12	2.0
	Codding Brook Lower Reservoir,	.12	4.52	.0016	.0084	.0011	.12	2.6
	Basin Pond Brook,	.59	4.54	.0028	.0187	.0028	.11	1.5
Lenox,	Reservoir,	.06	7.46	.0016	.0073	.0010	.11	5.7
Leominster,	Morse Reservoir,	.21	2.99	.0081	.0228	.0050	.19	0.4
	Haynes Reservoir,	.29	3.12	.0228	.0403	.0141	.18	0.4
	Fall Brook Reservoir,	.13	2.69	.0032	.0150	.0029	.21	0.6
Lincoln,	Sandy Pond,	.09	4.21	.0049	.0166	.0033	.39	1.5
Longmeadow,	Cooley Brook,	.09	5.31	.0040	.0069	.0016	.25	2.4[2]
Lynn,	Birch Reservoir,	.22	5.26	.0081	.0226	.0036	.73	1.9
	Breed's Reservoir,	.37	5.95	.0095	.0269	.0046	.73	2.1
	Walden Reservoir,	.47	6.45	.0076	.0240	.0036	.78	2.3
	Hawkes Reservoir,	.58	6.95	.0088	.0302	.0050	.81	2.7
Manchester,	Gravel Pond,	.13	4.65	.0050	.0158	.0022	.90	1.1
Marlborough,	Lake Williams,	.13	5.19	.0035	.0193	.0023	.56	1.8
	Milham Brook Reservoir,	.52	5.45	.0062	.0256	.0045	.44	1.6
Maynard,	White Pond,	.28	3.55	.0011	.0142	.0019	.29	1.0

[1] Average of three years.

[2] Average of four years.

Averages of Chemical Analyses from 1915 to 1919, inclusive — Continued.

[Parts in 100,000.]

City or Town.	Source.	Color.	Residue on Evaporation.	Ammonia.			Chlorine.	Hardness.
				Free.	Albuminoid.			
					Total.	Suspended.		
Milford,	Charles River, filtered,	.22	5.86	.0011	.0074	–	.37	2.5
Montague,[1]	Lake Pleasant,	.05	2.88	.0019	.0111	.0028	.16	0.8
Nantucket,[2]	Wannacomet Pond,	.10	7.12	.0037	.0175	.0053	2.24	1.5
New Bedford,	Little Quittacas Pond,	.39	4.29	.0044	.0222	.0029	.58	1.0
	Great Quittacas Pond,	.50	4.30	.0036	.0225	.0030	.57	0.9
North Adams,	Notch Brook Reservoir,	.06	7.22	.0021	.0060	.0010	.09	5.8
	Beaman Reservoir,	.05	7.18	.0030	.0102	.0020	.10	4.9
Northampton,	Middle Reservoir,	.23	4.29	.0023	.0139	.0025	.17	1.7
	Mountain Street Reservoir,	.09	4.05	.0017	.0089	.0016	.14	1.8
North Andover,	Great Pond,	.16	5.09	.0030	.0190	.0020	.48	1.9
Northborough,	Lower Reservoir,	.75	4.61	.0054	.0280	.0052	.32	1.2
	Upper Reservoir,	.86	5.35	.0067	.0293	.0060	.34	1.3[3]
Northbridge,	Cook Allen Reservoir,	.10	3.21	.0027	.0083	.0014	.23	0.7
North Brookfield,	Doane Pond,	.43	3.69	.0078	.0331	.0082	.19	1.1
	North Pond,	.48	3.56	.0060	.0365	.0120	.19	0.9
Northfield,	Reservoir,	.23	3.67	.0007	.0079	.0006	.14	1.2
Orange,	Reservoir,	.10	3.22	.0010	.0050	.0004	.13	1.0
Palmer (Fire District No. 1).	Lower Reservoir,	.25	3.58	.0070	.0148	.0031	.19	1.0
Peabody,	Spring Pond,	.29	6.32	.0109	.0225	.0051	.80	2.4
	Suntaug Lake,	.06	5.49	.0082	.0203	.0032	1.08	2.8[4]
Pittsfield,	Ashley Brook,	.20	5.92	.0039	.0138	.0016	.11	3.8
	Hathaway Brook,	.05	9.09	.0016	.0066	.0011	.13	7.3
	Sacket Brook,	.13	6.73	.0017	.0069	.0007	.12	5.5
	Farnham Reservoir,	.58	4.81	.0040	.0213	.0030	.12	1.8
Plymouth,	Little South Pond,	.02	2.85	.0030	.0209	.0032	.68	0.3
	Great South Pond,	.01	2.95	.0034	.0172	.0024	.69	0.2
Randolph,	Great Pond,	.41	4.81	.0023	.0179	.0021	.66	1.2
Rockport,	Cape Pond,	.38	11.88	.0100	.0299	.0084	4.47	2.2
Russell,	Black Brook,	.20	3.87	.0008	.0095	.0012	.16	1.5
Rutland,	Muschopauge Lake,	.06	2.86	.0017	.0131	.0026	.32	1.0

[1] Supply for Turner's Falls Fire District, Millers Falls Water Supply District and Lake Pleasant Water Supply District.

[2] Not including Siasconset supply.

[3] Average of three years.

[4] Average of four years.

Averages of Chemical Analyses from 1915 to 1919, inclusive — Concluded.

[Parts in 100,000.]

City or Town.	Source.	Color.	Residue on Evaporation.	Ammonia.			Chlorine.	Hardness.
				Free.	Albuminoid.			
					Total.	Suspended.		
Salem,	Wenham Lake,	.36	7.45	.0115	.0263	.0061	.97	2.5
	Longham Reservoir,	1.31	7.84	.0190	.0452	.0114	.96	1.9
Shelburne (Shelburne Falls Fire District).	Fox Brook,	.05	5.50	.0004	.0048	.0005	.11	3.2
Southbridge,	Hatchet Brook Reservoir No. 3,	.22	3.27	.0039	.0178	.0032	.20	0.8
	Hatchet Brook Reservoir No. 4,	.24	3.07	.0053	.0205	.0038	.20	0.7
South Hadley (Fire District No. 1).	Leaping Well Reservoir,	.08	3.37	.0063	.0192	.0079	.20	0.9
	Buttery Brook Reservoir,	.12	4.47	.0070	.0106	.0023	.33	1.1
Spencer,	Shaw Pond,	.07	2.71	.0017	.0151	.0015	.21	1.0
Springfield,	Westfield Little River, filtered,	.19	3.79	.0011	.0082	–	.15	1.3
Stockbridge,	Lake Averic,	.12	7.52	.0020	.0176	.0031	.11	5.2
Stoughton,	Muddy Pond Brook,	.19	3.90	.0007	.0089	.0018	.40	1.0
Taunton,	Assawompsett Pond,	.30	4.15	.0040	.0197	.0029	.55	0.8
	Elder's Pond,	.13	3.81	.0043	.0188	.0026	.55	0.8
Wakefield,	Crystal Lake,	.23	5.98	.0100	.0251	.0035	.84	2.0
Wareham (Onset),	Jonathan Pond,	.02	2.59	.0011	.0096	.0013	.67	0.4
Wayland,	Snake Brook Reservoir,	.87	5.48	.0091	.0336	.0046	.38	1.6
Westfield,	Montgomery Reservoir,	.44	3.31	.0048	.0183	.0026	.15	0.6
	Tillotson Brook Reservoir,	.14	3.23	.0023	.0082	.0012	.17	0.7
West Springfield,	Bear Hole Brook, filtered,	.06	7.96	.0018	.0055	–	.21	4.3
Weymouth,	Great Pond,	.79	4.15	.0044	.0204	.0025	.52	0.8
Williamsburg,	Reservoir,	.14	4.44	.0013	.0090	.0014	.15	1.9
Williamstown,	Reservoirs,	.04	8.08	.0012	.0108	.0050	.10	6.2
Winchester,	North Reservoir,	.08	3.93	.0038	.0159	.0025	.44	1.5
	South Reservoir,	.08	3.73	.0044	.0158	.0029	.41	1.5
	Middle Reservoir,	.15	3.62	.0047	.0235	.0045	.42	1.3
Worcester,	Bottomly Reservoir,	.27	4.64	.0048	.0194	.0026	.24	1.6
	Kent Reservoir,	.23	4.21	.0031	.0174	.0031	.27	1.5
	Leicester Reservoir,	.18	3.92	.0052	.0172	.0022	.24	1.2
	Mann Reservoir,	.18	4.33	.0031	.0163	.0022	.24	1.6
	Upper Holden Reservoir,	.15	3.24	.0021	.0114	.0018	.24	0.9
	Lower Holden Reservoir,	.13	3.13	.0030	.0131	.0017	.23	0.9
	Kendall Reservoir,	.22	4.05	.0037	.0166	.0029	.26	1.2

Ground Water Sources.

Averages of Chemical Analyses from 1915 to 1919, inclusive.

[Parts in 100,000.]

City or Town.	Source.	Color.	Residue on Evaporation.	Ammonia.		Chlorine.	Nitrogen as —		Hardness.	Iron.
				Free.	Albuminoid.		Nitrates.	Nitrites.		
Acton (West and South Water Supply District).	Tubular wells,	.00	9.13	.0005	.0020	.69	.1500	.0001	3.6	.006
Amesbury,	Tubular wells,	.23	16.48	.0027	.0044	.57	–	–	9.0	.194
Ashland,	Tubular wells, old supply,	.00	4.51	.0006	.0020	.41	–	–	1.4	.007
Attleboro,	Large well,	.05	5.15	.0005	.0053	.58	.0163	.0000	1.9	.010
Avon,	Wells,	.00	6.76	.0008	.0025	.56	.1984	.0000	2.3	.007
Ayer,	Large well,	.01	6.79	.0005	.0028	.64	.0542	.0000	2.7	.010
	Tubular wells,	.02	5.99	.0005	.0021	.28	.0090	.0001	2.5	.017
Barnstable,	Tubular wells,	.00	4.41	.0007	.0020	1.16	–	–	0.7	.012
Bedford,	Large well,	.05	4.44	.0007	.0034	.36	–	–	1.7	.021
Billerica,	Old wells,	.19	7.62	.0017	.0064	.47	–	–	2.7	.098
	New wells,	.13	7.80	.0013	.0050	.41	–	–	3.1	.069 [1]
Braintree,	Filter-gallery,	.27	9.02	.0018	.0139	1.13	.1564	.0000	2.7	.024
Bridgewater,	Wells,	.01	5.64	.0007	.0021	.67	.0309	.0002	1.7	.029
Brookfield (East),	Tubular wells,	.00	3.32	.0004	.0016	.23	–	–	0.7	.008
Brookline,	Tubular wells and filter-gallery, filtered.	.17	9.25	.0007	.0079	.79	.0294	.0000	4.3	.014 [1]
Canton,	Springdale well,	.03	4.56	.0004	.0034	.46	.0115	.0000	1.4	.008 [2]
	Well near Henry's Spring,	.10	5.17	.0005	.0042	.55	.0264	.0000	1.6	.008
Chelmsford (North Chelmsford Fire District).	Tubular wells,	.11	5.09	.0121	.0086	.48	.0427	.0001	1.9	.017
Chelmsford (Water District).	Tubular wells,	.00	8.21	.0005	.0015	.65	.1275	.0002	2.9	.008
Chicopee (Fairview),	Tubular wells,	.04	5.21	.0004	.0017	.23	.0562	.0002	1.5	.030
Cohasset,	Tubular wells,	.10	14.19	.0007	.0076	1.96	.1422	.0001	5.4	.011
	Dug well, filtered,	.38	9.00	.0017	.0127	1.30	.0060	.0000	2.9	.035
Dedham,	Large well and tubular wells.	.06	10.19	.0016	.0059	1.08	.1178	.0001	4.2	.008
Deerfield (Fire District).	Tubular wells,	.00	5.17	.0004	.0027	.15	–	–	2.6	.010 [2]
Douglas,	Tubular wells,	.01	4.88	.0005	.0017	.39	.0433	.0000	1.7	.063
Dracut (Water Supply District).	Tubular wells,	.00	8.29	.0004	.0016	.56	.0857	.0000	3.9	.011
Dracut (Collinsville).	Tubular wells,	.05	6.41	.0005	.0053	.37	.0225	.0000	2.5	.024
Dudley,	Tubular wells,	.00	3.58	.0003	.0020	.25	–	–	1.1	.005
Duxbury (Fire and Water District).	Tubular wells,	.00	4.36	.0004	.0017	.86	.0150	.0000	0.6	.006
Easthampton,	Tubular wells,	.00	7.21	.0003	.0013	.16	.0240	.0000	3.9	.007

[1] Average of three years.

[2] Average of four years.

Averages of Chemical Analyses from 1915 to 1919, inclusive — Continued.

[Parts in 100,000.]

City or Town.	Source.	Color.	Residue on Evaporation.	Ammonia.		Chlorine.	Nitrogen as —		Hardness.	Iron.
				Free.	Albuminoid.		Nitrates.	Nitrites.		
Easton (North Easton Village District).	Well,	.00	4.99	.0004	.0022	.60	.0464	.0000	1.7	.008
Edgartown,	Large well,	.00	3.19	.0003	.0015	.96	–	–	0.3	.005
Fairhaven,	Tubular wells,	.42	8.09	.0017	.0115	1.04	.0726	.0000	2.6	.014
Foxborough (Water Supply District).	Tubular wells,	.00	4.97	.0006	.0018	.50	.0408	.0000	1.7	.013
Framingham,	North filter-gallery,	.02	11.56	.0117	.0069	1.74	.0152	.0003	5.3	.014[1]
	South filter-gallery,	.02	12.36	.0310	.0077	2.00	.0228	.0006	5.3	.006[1]
Franklin,	Tubular wells,	.00	5.26	.0005	.0020	.58	.0317	.0000	1.8	.008
Grafton,	Filter-gallery,	.06	12.61	.0009	.0044	1.68	.1802	.0000	4.8	.021
Granville,	Well,	.02	4.15	.0004	.0028	.16	–	–	1.8	.013
Groton,	Large well,	.00	6.41	.0004	.0028	.24	.0019	.0000	3.1	.011
Groton (West Groton Water Supply District).	Tubular wells	.00	4.83	.0004	.0016	.19	.0118	.0000	2.8	.010
Hingham,	Wells,	.36	6.30	.0064	.0111	.78	.0204	.0002	1.8	.019
Holliston,	Large well,	.50	5.12	.0030	.0179	.41	.0056	.0000	1.4	.102
Hopkinton,	Tubular wells,	.00	13.16	.0009	.0029	1.15	.2793	.0001	5.4	.018
Kingston,	Tubular wells,	.00	4.72	.0005	.0018	.74	–	–	1.1	.010
Leicester (Water Supply District).	Wells,	.14	6.41	.0015	.0062	.37	–	–	2.2	.031
Leicester (Cherry Valley and Rochdale Water District).	Wells,	.13	5.17	.0054	.0082	.31	–	–	2.2	.009
Littleton,	Tubular wells,	.00	4.39	.0003	.0016	.22	.0174	.0000	1.7	.006[2]
Lowell,	Boulevard wells (tubular),	.45	6.96	.0427	.0073	.43	.0222	.0001	2.8	.278
	Boulevard wells, filtered,	.08	6.55	.0007	.0052	.45	.0398	.0000	2.5	.018[1]
Manchester,	Wells,	.00	12.15	.0003	.0016	2.01	.1523	.0000	4.0	.015
Mansfield (Water Supply District).	Large well,	.00	4.41	.0006	.0019	.45	.0550	.0000	1.6	.007
Marion,	Tubular wells,	.00	4.52	.0003	.0017	.73	.0286	.0000	1.2	.007
Marshfield,	Wells,	.00	29.42	.0004	.0023	10.51	.1030	.0001	6.4	.024[2]
Mattapoisett,	Tubular wells,	.00	6.53	.0005	.0020	.96	.0464	.0000	2.2	.007
Medfield,	Spring,	.00	4.15	.0005	.0036	.37	.0088	.0000	1.4	.009
Medway,	Wells,	.01	7.28	.0005	.0022	.60	.0445	.0000	2.9	.009
Merrimac,	Tubular wells,	.00	6.89	.0005	.0019	.54	.0152	.0000	2.8	.012
Methuen,	Tubular wells,	.32	7.73	.0024	.0098	.48	.0160	.0000	3.0	.086
Middleborough (Fire District).	Well,	.39	7.42	.0066	.0083	.67	.0336	.0001	2.5	.360

[1] Average of three years.

[2] Average of four years.

Averages of Chemical Analyses from 1915 to 1919, inclusive — Continued.

[Parts in 100,000.]

City or Town.	Source.	Color.	Residue on Evaporation.	Ammonia.		Chlorine.	Nitrogen as —		Hardness.	Iron.
				Free.	Albuminoid.		Nitrates.	Nitrites.		
Middleborough (Fire District) — *Con.*	Filtered water,	.10	6.41	.0005	.0051	.67	.0331	.0000	2.4	.028
Millbury,	Well,	.02	4.53	.0009	.0040	.34	.0125	.0000	1.7	.019
Millis,	Spring,	.00	10.23	.0004	.0016	.80	.2285	.0000	4.2	.006
Monson,	Large well,	.07	3.57	.0004	.0035	.20	–	–	0.9	.009
Natick,	Large well,	.00	9.59	.0006	.0030	.82	.0274	.0000	4.6	.006
Needham,	Wells,	.01	6.98	.0004	.0026	.73	.1004	.0000	2.6	.014[1]
	Hicks Spring,	.02	7.35	.0008	.0035	.79	.1610	.0000	2.3	.007
Newburyport,	Wells and Artichoke River, filtered.	.19	7.30	.0036	.0133	.73	.0194	.0000	2.9	.044[1]
Newton,	Tubular wells and filter-gallery.	.02	6.71	.0006	.0037	.53	.0433	.0001	2.7	.008
North Attleborough,	Wells,	.01	6.22	.0008	.0025	.53	.0260	.0000	2.3	.010
Norton,	Tubular wells,	.00	4.38	.0002	.0013	.49	–	–	1.3	.008
Norwood,	Tubular wells,	.14	9.73	.0018	.0061	.61	.0368	.0001	4.2	.051
Oak Bluffs,	Springs,	.00	4.47	.0008	.0023	1.02	.0155	.0000	0.8	.009
Oxford,	Tubular wells,	.00	4.93	.0003	.0016	.35	.0463	.0000	1.8	.005
Palmer (Bondsville),	Tubular wells,	.00	5.63	.0006	.0020	.22	.0197	.0000	2.0	.013
Pepperell,	Tubular wells,	.00	3.48	.0002	.0017	.20	–	–	1.4	.006
Plainville,	Tubular wells,	.01	4.92	.0005	.0016	.37	–	–	2.2	.019
Provincetown,	Tubular wells,	.01	17.06	.0002	.0015	8.71	–	–	3.8	.019
Reading,	Filter-gallery,	.68	12.95	.0231	.0164	2.12	.0093	.0002	3.3	.376
	Filtered water,	.23	19.19	.0010	.0093	1.75	.0118	.0005	8.8	.038
Salisbury,	Well,	.14	9.24	.0005	.0036	.60	–	–	4.2	.027[2]
Scituate,	Tubular wells,	.00	16.19	.0003	.0023	3.35	.1982	.0000	5.4	.007
Sharon,	Well,	.01	13.65	.0004	.0017	1.82	.2749	.0000	5.6	.007
	Tubular wells,	.00	5.04	.0004	.0016	.49	.0326	.0000	1.9	.013
Sheffield,	Spring,	.00	3.70	.0017	.0023	.09	.0046	.0000	1.8	.006
Shirley (Shirley Village Water District).	Well,	.00	4.76	.0003	.0014	.49	.1282	.0000	1.4	.007
Shrewsbury,	Tubular wells,	.00	4.98	.0003	.0021	.52	.0459	.0000	1.7	.006[2]
South Hadley (Fire District No. 2).	Large well,	.01	4.28	.0004	.0018	.17	.0331	.0000	1.5	.007
Tisbury,	Well,	.00	4.44	.0002	.0019	.96	.0048	.0000	0.6	.008
Uxbridge,	Tubular wells,	.00	5.42	.0004	.0022	.55	.0542	.0000	1.8	.007
Walpole,	Tubular wells,	.00	4.92	.0002	.0018	.46	.0341	.0000	1.8	.013
Waltham,	Old well,	.15	8.94	.0044	.0042	.83	.0175	.0000	3.9	.074

[1] Average of three years.

[2] Average of four years.

Averages of Chemical Analyses from 1915 to 1919, inclusive — Concluded.

[Parts in 100,000.]

City or Town.	Source.	Color.	Residue on Evaporation.	Ammonia.		Chlorine.	Nitrogen as —		Hardness.	Iron.
				Free.	Albuminoid.		Nitrates.	Nitrites.		
Waltham — *Con.*	New well,	.00	7.96	.0013	.0041	.65	.0181	.0000	3.7	.007
Ware,	Wells,	.00	7.04	.0002	.0017	.47	.1351	.0000	2.4	.007
Wareham (Fire District).	Tubular wells,	.00	3.36	.0005	.0018	.59	–	–	0.6	.008
Webster,	Wells,	.02	4.08	.0009	.0044	.36	.0134	.0000	1.6	.015
Wellesley,	Tubular wells,	.01	9.87	.0006	.0023	1.16	.0622	.0000	4.2	.012
	Well at Williams Spring,	.00	15.53	.0016	.0027	1.35	.5771	.0000	5.6	.008
	Filter-gallery,	.01	9.43	.0018	.0036	1.03	.0882	.0000	4.1	.006[1]
Westborough,	Filter basin,	.03	3.27	.0020	.0097	.29	–	–	1.1	.013
West Brookfield,	Tubular wells,	.00	4.72	.0003	.0016	.27	.0441	.0000	1.3	.007
Westford,	Tubular wells,	.00	4.42	.0003	.0016	.19	–	–	1.7	.009
Weston,	Well,	.17	7.41	.0013	.0078	.61	.0346	.0000	3.1	.009
Winchendon,	Old well,	.12	4.07	.0039	.0038	.16	–	–	1.3	.250
	New well,	.06	3.24	.0004	.0033	.15	–	–	0.8	.009
Woburn,	Filter gallery,[2]	.00	11.99	.0026	.0047	1.55	.0287	.0001	5.5	.005[3]
Worthington (Fire District).	Springs,	.04	3.02	.0005	.0038	.11	–	–	1.4	.028
Wrentham,	Tubular wells,	.00	4.23	.0004	.0017	.40	.0463	.0000	1.4	.014

[1] Average of three years. [2] Mixture of wells and filter-gallery. [3] Average of four years.

Water Supply Statistics.

During the year 1920 but one new water works has been introduced in the cities and towns in Massachusetts, this one being for the town of Auburn. The reason that more works have not been installed has been previously explained as being due, in part, to the high cost of labor and materials, a condition which is gradually reverting back to normal. New works in a great many places are urgently needed, however.

Works for the public distribution of water in various cities and towns in Massachusetts have been in use since the year 1799, and as a means of reference as to when the works of the various cities and towns were installed, the character of the works, and the population and valuation of the town in which the works are located, the following table is submitted: —

City or Town.	Date of Introduction.	Ownership.	Ground or Surface Supply.	Population in 1920.	Municipal Valuation April 1, 1920.
Abington,	1887	Town,	Surface,	5,787	$4,243,042
Acton,	1912	West and South Water Supply District.	Ground,	2,162	2,414,185
Acushnet,	1916	Town (New Bedford Water Supply).	Surface,	3,075	2,567,452
Adams,	1874	Adams Fire District,	Surface and ground.	12,967	10,643,007
Agawam,	1877	Town (Springfield Water Supply),	Surface,	5,023	4,996,985
Alford,	–	– – – –	– –	248	224,072
Amesbury,	1885	Town,	Ground,	10,036	10,168,527
Amherst,	1880	Amherst Water Company,	Surface,	5,550	7,180,021
Andover,	1890	Town,	Surface,	8,268	10,086,766
Arlington,	1872	Town (Metropolitan Water Supply).	Surface,	18,665	24,118,118
Ashburnham,	1870	Town,	Surface,	2,012	1,454,467
Ashby,	–	– – – –	– –	834	761,338
Ashfield,	1904	Ashfield Water Company,	Surface,	869	1,035,864
Ashland,	1911	Town,	Ground,	2,287	2,084,150
Athol,	1875	Town,	Surface,	9,792	8,690,193
Attleboro,	1873	City,	Ground,	19,731	22,106,770
Auburn,	1920	Auburn Water Company,	Ground,	3,891	2,412,441
Avon,	1890	Town,	Ground,	2,176	1,396,341
Ayer,	1887	Town,	Ground,	3,052	3,055,335
Barnstable,	1912	Barnstable Water Company,	Ground,	4,836	10,163,250
Barre,	1895	Town,	Surface,	3,357	3,118,820
Becket,	–	– – – –	– –	674	782,366
Bedford,	1909	Town,	Ground,	1,362	2,283,686
Belchertown,	–	– – – –	– –	2,058	1,173,870
Bellingham,	–	– – – –	– –	2,102	1,526,955
Belmont,	1887	Town (Metropolitan Water Supply).	Surface,	10,749	15,730,691
Berkley,	–	– – – –	– –	935	732,655
Berlin,	–	– – – –	– –	868	867,607
Bernardston,	–	– – – –	– –	769	642,058
Beverly,	1868	City,	Surface,	22,561	41,903,615
Billerica,	1898	Town,	Ground,	3,646	6,854,879
Blackstone,	1911	Town (Woonsocket, R. I., Water Supply).	Surface,	4,299	2,127,465
Blandford,	1909	Blandford Fire District,	Surface,	479	897,887
Bolton,	–	– – – –	– –	708	842,275
Boston,	1848	City (Metropolitan Water Supply).	Surface,	748,060	1,572,457,180
Bourne,	–	– – – –	– –	2,530	6,244,000
Boxborough,	–	– – – –	– –	298	351,644
Boxford,	–	– – – –	– –	588	987,807

City or Town.	Date of Introduction.	Ownership.	Ground or Surface Supply.	Population in 1920.	Municipal Valuation April 1, 1920.
Boylston,	–	–	–	794	$649,306
Braintree,	1887	Town,	Surface,	10,580	11,092,239
Brewster,	–	–	–	688	1,113,360
Bridgewater,	1888	Bridgewater Water Company,	Ground,	8,438	4,751,311
Brimfield,	–	–	–	778	946,250
Brockton,	1880	City,	Surface,	66,254	60,628,361
Brookfield,	1889	Town,	Surface and ground.	2,216	1,768,596
Brookline,	1875	Town,	Ground,	37,748	103,636,400
Buckland,	–	–	–	1,433	2,341,876
Burlington,	–	–	–	885	1,424,102
Cambridge,	1856	City,	Surface,	109,694	141,704,972
Canton,	1889	Town,	Ground,	5,945	6,866,045
Carlisle,	–	–	–	463	582,686
Carver,	–	–	–	891	2,120,815
Charlemont,	–	–	–	808	765,657
Charlton,	–	–	–	1,995	1,639,920
Chatham,	–	–	–	1,737	2,795,650
Chelmsford,	1907 1914	North Chelmsford Fire District, Chelmsford Water District,	Ground,	5,682	6,421,540
Chelsea,	1867	City (Metropolitan Water Supply).	Surface,	43,184	41,364,400
Cheshire,	1876	Cheshire Water Company,	Surface,	1,476	941,612
Chester,	1893	Chester Fire District,	Surface,	1,302	1,016,673
Chesterfield,	–	–	–	441	436,702
Chicopee,	1845	City,	Surface and ground.	36,214	42,718,050
Chilmark,	–	–	–	240	455,524
Clarksburg,	–	–	–	1,136	505,669
Clinton,	1882	Town,	Surface,	12,979	11,774,907
Cohasset,	1886	Cohasset Water Company,	Ground,	2,639	6,647,539
Colrain,	1901 1902	Griswoldville Manufacturing Company (Griswoldville). Colrain Fire District No. 1,	Surface,	1,607	1,167,220
Concord,	1873	Town,	Surface,	6,461	7,331,008
Conway,	–	–	–	961	982,491
Cummington,	1916	Town,	Ground,	489	390,010
Dalton,	1884	Dalton Fire District,	Surface,	3,752	4,716,879
Dana,	–	–	–	599	537,104
Danvers,	1876	Town,	Surface,	11,108	8,671,925
Dartmouth,	1915	Town (New Bedford Water Supply).	Surface,	6,493	7,383,875
Dedham,	1881	Dedham Water Company,	Ground,	10,792	16,311,565

City or Town.	Date of Introduction.	Ownership.	Ground or Surface Supply.	Population in 1920.	Municipal Valuation April 1, 1920.
Deerfield,	1903	South Deerfield Water Supply District.	Surface,	2,803	$4,287,051
	1911	Deerfield Fire District,	Ground,		
Dennis,	–	– – – –	– –	1,536	1,517,435
Dighton,	–	– – – –	– –	2,574	2,973,227
Douglas,	1910	Town,	Ground,	2,181	1,656,730
Dover,	–	– – – –	– –	867	2,797,267
Dracut,	1900	American Woolen Company, Collinsville.	Ground,	5,280	3,311,301
	1906	Dracut Water Supply District,			
Dudley,	1910	Town,	Ground,	3,701	3,146,800
Dunstable,	1918	Town,	Ground,	353	434,890
Duxbury,	1914	Duxbury Fire and Water District.	Ground,	1,553	4,231,456
East Bridgewater,	1888	Town (Bridgewater Water Supply; Brockton Water Supply).	Ground and surface.	3,486	3,614,481
Eastham,	–	– – – –	– –	430	591,299
Easthampton,	1870	Town,	Ground,	11,261	12,489,697
East Longmeadow,	1913	Town (Springfield Water Supply).	Surface,	2,352	1,986,590
Easton,	1887	North Easton Village District,			
	1915	South Easton and Eastondale Fire and Water District (Brockton Water Supply).	Ground and surface.	5,041	4,476,684
	1916	Unionville Fire and Water District.			
Edgartown,	1906	Edgartown Water Company,	Ground,	1,190	1,786,825
Egremont,	1913	South Egremont Water Company.	Surface,	441	715,224
Enfield,	–	– – – –	– –	790	670,610
Erving,	1896	Millers Falls Water Supply District.	Surface,	1,295	1,836,832
Essex,	–	– – – –	– –	1,478	1,370,514
Everett,	1867	City (Metropolitan Water Supply).	Surface,	40,120	40,855,050
Fairhaven,	1894	Fairhaven Water Company,	Ground,	7,291	7,854,354
Fall River,	1874	City,	Surface,	120,485	178,728,693
Falmouth,	1899	Town,	Surface,	3,500	7,706,918
Fitchburg,	1872	City,	Surface,	41,029	48,050,360
Florida,	–	– – – –	– –	298	1,303,096
Foxborough,	1891	Foxborough Water Supply District.	Ground,	4,136	3,163,220
	1912	East Foxborough Water Supply District.			
Framingham,	1885	Town,	Surface and ground.	17,033	22,675,720
Franklin,	1884	Town,	Ground,	6,497	6,462,986
Freetown,	–	– – – –	– –	1,532	1,385,917
Gardner,	1882	Town,	Surface,	16,971	15,374,117
Gay Head,	–	– – – –	– –	144	65,605
Georgetown,	–	– – – –	– –	2,004	1,497,903

City or Town.	Date of Introduction.	Ownership.	Ground or Surface Supply.	Population in 1920.	Municipal Valuation April 1, 1920.
Gill,	1888	Riverside Water Company,	Ground,	879	$712,611
Gloucester,	1885	City,	Surface,	22,947	29,692,552
Goshen,	–	–	–	224	305,598
Gosnold,	–	–	–	131	1,002,223
Grafton,	1886	Grafton Water Company,	Ground,	6,887	3,792,103
Granby,	–	–	–	779	888,824
Granville,	1910	Granville Center Water Company.	Ground,	655	597,010
Great Barrington,	1867	Great Barrington Fire District,	Surface,	6,315	8,170,305
	1888	Housatonic Water Works Company, Housatonic.			
Greenfield,	1870	Greenfield Fire District No. 1,	Surface and ground.	15,462	17,242,462
Greenwich,	–	–	–	399	391,095
Groton,	1897	Groton Water Company,	Ground,	2,185	3,190,650
	1912	West Groton Water Supply District.			
Groveland,	1915	Town (Haverhill Water Supply),	Surface,	2,650	1,610,246
Hadley,	1905	Hadley Water Supply District,	Surface,	2,784	2,977,390
Halifax,	–	–	–	563	941,155
Hamilton,	–	–	–	1,631	4,250,789
Hampden,	–	–	–	624	487,078
Hancock,	–	–	–	464	399,434
Hanover,	–	–	–	2,575	2,335,728
Hanson,	–	–	–	1,910	2,085,278
Hardwick,	1887	George H. Gilbert Manufacturing Company.	Ground,	3,085	3,316,752
Harvard,	–	–	–	2,546	2,053,333
Harwich,	–	–	–	1,846	2,186,898
Hatfield,	1896	Town,	Surface,	2,651	2,432,825
Haverhill,	1802	City,	Surface,	53,884	64,125,571
Hawley,	–	–	–	390	295,134
Heath,	–	–	–	325	325,928
Hingham,	1880	Hingham Water Company,	Surface and ground.	5,604	8,917,067
Hinsdale,	1889	Hinsdale Fire District,	Surface,	1,065	810,568
Holbrook,	1888	Town,	Surface,	3,161	2,132,630
Holden,	1905	Town,	Surface,	2,970	2,536,319
Holland,	–	–	–	153	168,476
Holliston,	1891	Holliston Water Company,	Ground,	2,707	2,577,881
Holyoke,	1873	City,	Surface,	60,203	89,527,690
Hopedale,	1881	Milford Water Company,	Surface and ground.	2,777	3,397,653
Hopkinton,	1884	Town,	Ground,	2,289	2,093,587
Hubbardston,	–	–	–	1,045	885,751

City or Town.	Date of Introduction.	Ownership.	Ground or Surface Supply.	Population in 1920.	Municipal Valuation April 1, 1920.
Hudson,	1884	Town,	Surface,	7,607	$5,827,389
Hull,	1882	Hingham Water Company,	Surface and ground.	1,771	13,178,150
Huntington,	1899	Huntington Fire District,	Surface and ground.	1,425	1,040,095
Ipswich,	1894	Town,	Surface,	6,201	6,052,526
Kingston,	1886	Town,	Ground,	2,505	1,844,360
Lakeville,	–	– – – –	– –	1,419	1,284,210
Lancaster,	1885	Town (Clinton Water Supply),	Surface,	2,461	2,531,339
Lanesborough,	–	– – – –	– –	1,054	931,196
Lawrence,	1875	City,	Surface,	94,270	104,659,330
Lee,	1881	Berkshire Water Company,	Surface,	4,085	3,662,596
Leicester,	1891	Leicester Water Supply District,	Ground,	3,635	2,822,116
	1911	Cherry Valley and Rochdale Water District.			
Lenox,	1875	Lenox Water Company,	Surface,	2,691	7,378,422
Leominster,	1873	City,	Surface,	19,744	17,484,515
Leverett,	–	– – – –	– –	695	447,114
Lexington,	1884	Town (Metropolitan Water Supply).	Surface,	6,350	9,945,296
Leyden,	–	– – – –	– –	330	282,843
Lincoln,	1874	Town,	Surface,	1,042	1,969,111
Littleton,	1912	Town,	Ground,	1,277	1,630,355
Longmeadow,	1895	Town,	Surface,	2,618	4,967,612
Lowell,	1872	City,	Ground,	112,759	123,803,827
Ludlow,	1873	Ludlow Manufacturing Company (Springfield Water Supply).	Surface,	7,470	8,427,628
Lunenburg,	–	– – – –	– –	1,634	1,864,655
Lynn,	1871	City,	Surface,	99,148	101,544,572
Lynnfield,	–	– – – –	– –	1,165	1,976,018
Malden,	1870	City (Metropolitan Water Supply).	Surface,	49,103	44,542,777
Manchester,	1892	Town,	Surface and ground.	2,466	11,539,928
Mansfield,	1888	Mansfield Water Supply District,	Ground,	6,255	6,345,655
Marblehead,	1885	Town,	Surface and ground.	7,324	11,878,027
Marion,	1908	Town,	Ground,	1,288	3,326,240
Marlborough,	1883	City,	Surface,	15,028	13,293,501
Marshfield,	1890	Brant Rock Water Company,	Ground,	1,379	3,021,935
	1900	Humarock Water Company,			
Mashpee,	–	– – – –	– –	242	501,445
Mattapoisett,	1913	Town,	Ground,	1,277	2,143,276
Maynard,	1889	Town,	Surface,	7,086	5,184,220
Medfield,	1889	Medfield Water Company,	Ground,	3,595	2,209,389

City or Town.	Date of Introduction.	Ownership.	Ground or Surface Supply.	Population in 1920.	Municipal Valuation April 1, 1920.
Medford,	1870	City (Metropolitan Water Supply).	Surface,	39,038	$39,159,850
Medway,	1911	Town,	Ground,	2,956	2,407,055
Melrose,	1870	City (Metropolitan Water Supply).	Surface,	18,204	21,085,400
Mendon,	–	–	–	961	811,820
Merrimac,	1904	Town,	Ground,	2,173	1,728,342
Methuen,	1875	City,	Ground,	15,189	18,712,925
Middleborough,	1885	Middleborough Fire District,	Ground,	8,453	5,914,217
Middlefield,	–	–	–	280	291,584
Middleton,	1876	Town (Danvers Water Supply),	Surface,	1,195	1,119,101
Milford,	1881	Milford Water Company,	Surface and ground.	13,471	12,046,230
Millbury,	1895	Millbury Water Company,	Ground,	5,653	4,371,128
Millis,	1891	Town,	Ground,	1,485	2,047,446
Millville,	–	–	–	2,224	1,328,130
Milton,	1885	Town (Metropolitan Water Supply).	Surface,	9,382	21,293,325
Monroe,	–	–	–	173	401,507
Monson,	1895	Town,	Ground,	4,826	2,090,308
Montague,	1887	Turners Falls Fire District,	Surface,	7,675	9,174,190
	1886	Millers Falls Water Supply District.			
	1909	Lake Pleasant Water Supply District.			
	–	Montague Village (Edgar L. Bartlett).			
Monterey,	1917	Monterey Water Company,	Surface,	282	477,102
Montgomery,	–	–	–	229	218,018
Mount Washington,	–	–	–	73	166,375
Nahant,	1885	Town (Metropolitan Water Supply).	Surface,	1,318	4,159,697
Nantucket,	1878	Wannacomet Water Company,	Surface and ground.	2,797	5,659,990
	1913	Town (supply at Siasconset),	Ground,		
Natick,	1874	Town,	Ground,	10,907	9,754,425
Needham,	1890	Town,	Ground,	7,012	10,945,340
New Ashford,	–	–	–	116	88,815
New Bedford,	1869	City,	Surface,	121,217	182,889,883
New Braintree,	–	–	–	394	509,416
Newbury,	–	–	–	1,303	1,623,781
Newburyport,	1881	City,	Surface and ground.	15,618	11,919,502
New Marlborough,	–	–	–	1,010	1,503,567
New Salem,	–	–	–	512	514,800
Newton,	1876	City,	Ground,	46,054	86,376,380
Norfolk,	–	–	–	1,159	1,330,423
North Adams,	1861	City,	Surface and ground.	22,282	20,639,900

City or Town.	Date of Introduction.	Ownership.	Ground or Surface Supply.	Population in 1920.	Municipal Valuation April 1, 1920.
Northampton,	1871	City,	Surface,	21,951	$22,203,961
North Andover,	1898	Town,	Surface,	6,265	7,296,129
North Attleborough,	1884	Town,	Ground,	9,238	8,623,600
Northborough,	1882	Town,	Surface,	1,753	2,045,808
Northbridge,	1889	Whitin Machine Works (Whitinsville).	Ground,	10,174	6,006,224
North Brookfield,	1893	Town,	Surface,	2,610	2,173,100
Northfield,	1879	Northfield Schools, Inc.,	Surface and ground.	1,775	1,739,103
	1900	Northfield Water Company,	Surface,		
North Reading,	–	– – – –	– –	1,286	1,517,842
Norton,	1912	Norton Water Company,	Ground,	2,374	2,073,450
Norwell,	–	– – – –	– –	1,348	1,341,430
Norwood,	1885	Town,	Surface and ground.	12,627	18,647,488
Oak Bluffs,	1890	Cottage City Water Company,	Ground,	1,047	2,624,580
Oakham,	–	– – – –	– –	477	439,394
Orange,	1873	Town,	Surface and ground.	5,393	4,612,575
Orleans,	–	– – – –	– –	1,012	1,641,920
Otis,	–	– – – –	– –	361	409,363
Oxford,	1906	Oxford Water Company,	Ground,	3,820	2,435,268
Palmer,	1908	Boston Duck Company (Bondsville).	Ground,	9,896	9,683,698
	1920	Palmer Fire District No. 1 (Palmer).	Surface,		
Paxton,	–	– – – –	– –	489	488,633
Peabody,	1799	City,	Surface,	19,552	20,623,635
Pelham,	–	– – – –	– –	503	550,311
Pembroke,	–	– – – –	– –	1,358	1,449,065
Pepperell,	1909	Town,	Ground,	2,468	2,721,233
Peru,	–	– – – –	– –	149	288,691
Petersham,	–	– – – –	– –	642	1,385,576
Phillipston,	–	– – – –	– –	354	348,506
Pittsfield,	1855	City,	Surface,	41,763	43,759,915
Plainfield,	–	– – – –	– –	332	260,471
Plainville,	1909	Town (North Attleborough Water Supply).	Ground,	1,365	1,188,194
Plymouth,	1855	Town,	Surface,	13,045	20,860,000
Plympton,	–	– – – –	– –	469	570,668
Prescott,	–	– – – –	– –	236	265,082
Princeton,	–	– – – –	– –	682	1,118,828
Provincetown,	1893	Town,	Ground,	4,246	3,796,555
Quincy,	1884	City (Metropolitan Water Supply).	Surface,	47,876	56,577,605
Randolph,	1888	Town,	Surface,	4,756	3,008,600

City or Town.	Date of Introduction.	Ownership.	Ground or Surface Supply.	Population in 1920.	Municipal Valuation April 1, 1920.
Raynham,	–	–	–	1,695	$1,365,849
Reading,	1891	Town,	Ground,	7,439	9,196,445
Rehoboth,	–	–	–	2,065	1,747,213
Revere,	1884	City (Metropolitan Water Supply).	Surface,	28,823	28,537,600
Richmond,	–	–	–	561	590,847
Rochester,	–	–	–	1,047	1,172,526
Rockland,	1887	Town,	Surface,	7,544	6,629,853
Rockport,	1895	Town,	Surface,	3,878	4,545,264
Rowe,	–	–	–	333	278,324
Rowley,	–	–	–	1,249	1,098,021
Royalston,	–	–	–	819	998,704
Russell,	1911	Town,	Surface,	1,237	2,256,682
Rutland,	1896	Town,	Surface,	1,743	1,074,503
Salem,	1868	City,	Surface,	42,529	45,985,245
Salisbury,	1915	Salisbury Water Supply Company.	Ground,	1,701	2,334,699
Sandisfield,	–	–	–	460	511,071
Sandwich,	–	–	–	1,458	1,590,625
Saugus,	1878	Town (Lynn Water Supply; Metropolitan Water Supply).	Surface,	10,874	8,462,188
Savoy,	–	–	–	436	245,790
Scituate,	1901	Scituate Water Company,	Surface and ground.	2,534	7,295,345
Seekonk,	–	–	–	2,898	2,547,588
Sharon,	1885	Town,	Ground,	2,467	3,829,222
Sheffield,	1897	Sheffield Water Company,	Ground,	1,435	1,189,910
Shelburne,	1912	Shelburne Falls Fire District,	Surface,	1,436	2,337,539
Sherborn,	–	–	–	1,558	1,760,870
Shirley,	1903	Shirley Village Water District,	Ground,	2,260	1,964,565
Shrewsbury,	1915	Town,	Ground,	3,708	4,585,653
Shutesbury,	–	–	–	242	394,683
Somerset,	–	–	–	3,520	2,884,343
Somerville,	1867	City (Metropolitan Water Supply).	Surface,	93,091	83,910,855
Southampton,	–	–	–	814	764,000
Southborough,	–	–	–	1,838	2,380,611
Southbridge,	1880	Southbridge Water Supply Company.	Surface,	14,245	11,144,369
South Hadley,	1872	South Hadley Fire District No. 1,	Surface,	5,527	5,508,097
	1911	South Hadley Fire District No. 2,	Ground,		
Southwick,	–	–	–	1,194	1,099,914
Spencer,	1883	Town,	Surface,	5,930	3,810,507
Springfield,	1874	City,	Surface,	129,614	231,696,735

City or Town.	Date of Introduction.	Ownership.	Ground or Surface Supply.	Population in 1920.	Municipal Valuation April 1, 1920.
Sterling,	–	–	–	1,305	$1,459,310
Stockbridge,	1862	Stockbridge Water Company,	Surface,	1,764	5,745,797
Stoneham,	1883	Town (Metropolitan Water Supply).	Surface,	7,873	7,396,820
Stoughton,	1886	Town,	Surface,	6,865	5,867,198
Stow,	–	–	–	1,101	1,579,593
Sturbridge,	–	–	–	1,573	1,097,250
Sudbury,	–	–	–	1,121	1,490,085
Sunderland,	1883	Sunderland Water Company,	Surface,	1,289	921,109
Sutton,	–	–	–	2,578	1,693,259
Swampscott,	1885	Town (Metropolitan Water Supply).	Surface,	8,101	15,324,854
Swansea,	–	–	–	2,334	2,106,786
Taunton,	1876	City,	Surface,	37,137	34,811,725
Templeton,	–	–	–	4,019	2,595,342
Tewksbury,	–	–	–	4,450	2,889,746
Tisbury,	1887	Town,	Ground,	1,275	2,428,159
Tolland,	–	–	–	192	345,616
Topsfield,	–	–	–	900	2,361,460
Townsend,	–	–	–	1,575	2,069,544
Truro,	–	–	–	554	650,395
Tyngsborough,	–	–	–	1,044	940,055
Tyringham,	–	–	–	267	399,655
Upton,	–	–	–	1,693	1,482,953
Uxbridge,	1879	Town,	Ground,	5,384	6,244,860
Wakefield,	1883	Town,	Surface,	13,025	13,550,701
Wales,	–	–	–	419	359,407
Walpole,	1896	Town,	Ground,	5,446	8,109,828
Waltham,	1873	City,	Ground,	30,915	38,249,575
Ware,	1886	Town,	Ground,	8,525	6,594,755
Wareham,	1894	Onset Water Company,	Surface,	4,415	8,240,584
	1908	Wareham Fire District,	Ground,		
Warren,	–	–	–	3,467	3,822,662
Warwick,	–	–	–	327	472,048
Washington,	–	–	–	240	311,408
Watertown,	1885	Town (Metropolitan Water Supply).	Surface,	21,457	28,892,703
Wayland,	1878	Town,	Surface,	1,935	3,015,300
Webster,	1881	Town,	Ground,	13,258	10,365,216
Wellesley,	1884	Town,	Ground,	6,224	18,234,610
Wellfleet,	–	–	–	826	879,700

City or Town.	Date of Introduction.	Ownership.	Ground or Surface Supply.	Population in 1920.	Municipal Valuation April 1, 1920.
Wendell,	–	–	–	346	$666,726
Wenham,	–	–	–	1,090	2,708,410
Westborough,	1879	Town,	Ground,	5,789	3,712,997
West Boylston,	–	–	–	1,624	1,281,697
West Bridgewater,	1911	Town (Brockton Water Supply),	Surface,	2,908	2,077,244
West Brookfield,	1913	Town,	Ground,	1,281	1,140,391
Westfield,	1874	City,	Surface,	18,604	14,167,407
Westford,	1908	Westford Water Company,	Ground,	3,170	2,735,339
Westhampton,	–	–	–	305	316,210
Westminster,	–	–	–	1,343	1,156,051
West Newbury,	–	–	–	1,492	1,082,889
Weston,	1896	Weston Water Company,	Ground,	2,282	5,411,290
Westport,	–	–	–	3,115	4,637,925
West Springfield,	1875	Town,	Surface,	13,443	17,777,121
West Stockbridge,	1873	East Mountain Water Company,	Ground,	1,058	751,670
West Tisbury,	–	–	–	345	600,168
Westwood,	–	–	–	1,358	2,760,223
Weymouth,	1885	Town,	Surface,	15,057	14,811,209
Whately,	–	–	–	1,234	954,599
Whitman,	1883	Town (Brockton Water Supply),	Surface,	7,147	6,262,978
Wilbraham,	–	–	–	2,780	2,120,623
Williamsburg,	1903	Town,	Surface,	1,866	1,192,074
Williamstown,	1859	Williamstown Water Company,	Ground,	3,707	5,154,178
Wilmington,	–	–	–	2,581	2,441,419
Winchendon,	1896	Town,	Ground,	5,904	4,883,380
Winchester,	1873	Town,	Surface,	10,485	22,322,125
Windsor,	–	–	–	403	388,165
Winthrop,	1884	Town (Metropolitan Water Supply).	Surface,	15,455	18,229,450
Woburn,	1873	City,	Ground,	16,574	16,377,302
Worcester,	1845	City,	Surface,	179,754	232,004,780
Worthington,	1911	Worthington Fire District,	Surface and ground.	409	486,006
Wrentham,	1908	Town,	Ground,	2,808	1,908,254
Yarmouth,	–	–	–	1,229	2,023,424

Note. — East Brookfield not considered as a town in this report.

Of the above cities and towns in Massachusetts, all of the 39 cities and 177 of the towns are provided with public water supplies. The following table shows the cities and towns having and not having public water supplies at the end of the year 1920: —

Population, 1920.	Number of Places of Given Population having Public Water Supplies.	Total Population of Places in Preceding Column.	Number of Places of Given Population not having Public Water Supplies.	Total Population of Places in Preceding Column.
Under 500,	6	2,453	44	13,667
500–999,	3	2,403	32	23,872
1,000–1,499,	24	30,799	28	34,471
1,500–1,999,	10	17,468	15	25,377
2,000–2,499,	17	38,811	6	12,787
2,500–2,999,	17	46,408	8	21,062
3,000–3,499,	7	22,386	2	6,582
3,500–3,999,	11	40,833	1	3,520
4,000 and over,	121	3,500,988	2	8,469
Totals,	216	3,702,549	138	149,807

The following table indicates when a fairly complete system of water supply was introduced in each city and town: —

Years.	Number of Public Water Supplies introduced.	Years.	Number of Public Water Supplies introduced.
Previous to 1850,	5	1890–1899, inclusive,	34
1850–1859, inclusive,	4	1900–1909, inclusive,	21
1860–1869, inclusive,	9	1910–1919, inclusive,	27
1870–1879, inclusive,	45	1920,	1
1880–1889, inclusive,	70	Total,	216

At the end of the year 1920 the water supplies in all of the cities in Massachusetts and in 134 of the towns were owned either by the city or town or by a water supply or fire district. In 43 towns the works were owned by private companies.

The following table gives the classification by population of the cities and towns which own their water works, and those which are supplied by private water companies: —

Population, 1920.	Number of Places of Given Population owning Water Works.	Total Population of Places in Preceding Column.	Number of Places of Given Population supplied with Water by Private Companies.	Total Population of Places in Preceding Column.
Under 1,000,	4	1,730	5	3,126
1,000–1,999,	23	32,382	11	15,885
2,000–2,999,	26	64,418	8	20,801
3,000–3,999,	12	41,951	6	21,268
4,000–4,999,	6	26,678	2	8,921
5,000–5,999,	13	72,131	3	16,807
6,000–6,999,	10	63,926	1	6,887
7,000–7,999,	9	66,707	2	14,761
8,000 and over,	70	3,167,050	5	57,120
Totals,	173	3,536,973	43	165,576

The following table shows, for the census years since 1890, the total population of all cities and towns supplied with water, and the total population of those supplied by private companies, with the percentage of the total population so supplied: —

Year.	Total Population of All Places supplied with Water.	Population of Places supplied by Private Companies.	Per Cent of Total Population.
1890,	1,924,812	318,319	16.5
1895,	2,237,017	212,579	9.5
1900,	2,565,301	236,869	9.2
1905,	2,792,490	193,290	6.9
1910,	3,171,055	159,730	5.0
1915,	3,528,769	174,760	5.0
1920,	3,536,973	165,576	4.7

The foregoing table shows that the total population of the places supplied with water by private companies is only 4.7 per cent of the total population of all the places supplied with water. Of the towns supplied by private water companies, only 11 have a population in excess of 5,000. These towns are as follows: —

Town.	Population, 1920.	Town.	Population, 1920.
Southbridge,	14,245	Fairhaven,	7,291
Milford,	13,471	Grafton,	6,887
Dedham,	10,792	Millbury,	5,653
Northbridge,	10,174	Hingham,	5,604
Bridgewater,	8,438	Amherst,	5,550
Ludlow,	7,470		

Consumption of Water.

The consumption of water in 1920 in the various cities and towns in which records are kept is shown in the following table, and the figures represent all the public supplies in any one municipality: —

Consumption of Water in Various Cities and Towns in 1920.

City or Town.	Population, Census of 1920.	Average Daily Consumption.		City or Town.	Population, Census of 1920.	Average Daily Consumption.	
		Gallons.	Gallons per Inhabitant.			Gallons.	Gallons per Inhabitant.
Metropolitan Water District:[1] —	1,206,849	127,265,500	106	Abington and Rockland.	13,331	657,000	49
Arlington,	18,665	1,055,600	57	Acushnet,	3,075	48,000	16
Belmont,	10,749	591,400	55	Agawam,	5,023	179,000	36
Boston,	748,060	94,297,400	126	Amesbury,	10,036	564,000	56
Chelsea,	43,184	3,316,400	77	Andover,	8,268	621,000	75
Everett,	40,120	3,455,200	86	Ashburnham,	2,012	142,000	71
Lexington,	6,350	424,300	67	Athol,	9,792	798,000	81
Malden,	49,103	2,793,300	57	Attleboro,	19,731	1,151,000	58
Medford,	39,038	1,739,700	45	Avon,	2,176	94,000	43
Melrose,	18,204	1,108,100	61	Barnstable,	4,836	159,000	33
Milton,	9,382	430,900	46	Bedford,	1,362	41,000	30
Nahant,	1,318	192,600	146	Beverly,	22,561	1,590,000	70
Quincy,	47,876	4,472,500	93	Billerica,	3,646	513,000	141
Revere,	28,823	1,975,900	69	Braintree,	10,580	742,000	70
Somerville,	93,091	7,177,300	77	Bridgewater,	8,438	223,000	26
Stoneham,	7,873	789,600	100	Brockton,	66,254	2,931,000	44
Swampscott,	8,101	657,200	81	Brookline,	37,748	3,451,000	91
Watertown,	21,457	1,911,700	89	Cambridge,	109,694	11,435,000	104
Winthrop,	15,455	876,400	57	Chelmsford,	5,682	130,000	23

[1] Figures for metropolitan consumption are exclusive of Newton and are based entirely on meter readings. District result based on pumpage will vary slightly from the above.

Consumption of Water in Various Cities and Towns in 1920 — Continued.

City or Town.	Population, Census of 1920.	Average Daily Consumption.		City or Town.	Population, Census of 1920.	Average Daily Consumption.	
		Gallons.	Gallons per Inhabitant.			Gallons.	Gallons per Inhabitant.
Clinton,	12,979	758,000	58	Littleton,	1,277	44,000	34
Cohasset,	2,639	346,000	131	Longmeadow,	2,618	96,000	37
Concord,	6,461	585,000	91	Lowell,	112,759	7,144,000	63
Danvers and Middleton.	12,303	1,510,000	123	Ludlow,	7,470	202,000	27
Dedham,	10,792	799,000	74	Lynn and Saugus,	110,022	9,084,000	83
Dracut,	5,280	97,000	18	Manchester,	2,466	293,000	119
Dudley,	3,701	106,000	29	Mansfield,	6,255	531,000	85
Duxbury,	1,553	74,000	48	Marblehead,	7,324	635,000	87
Easthampton,	11,261	723,000	64	Marion,	1,288	95,000	74
East Longmeadow,	2,352	32,000	14	Marlborough,	15,028	698,000	46
Easton,	5,041	182,000	36	Mattapoisett,	1,277	55,000	43
Edgartown,	1,190	84,000	71	Maynard,	7,086	330,000	47
Fairhaven,	7,291	353,000	48	Medway,	2,956	122,000	41
Fall River,	120,485	6,376,000	53	Merrimac,	2,173	111,000	51
Falmouth,	3,500	383,000	109	Methuen,	15,189	762,000	50
Fitchburg,	41,029	4,406,000	107	Middleborough,	8,453	405,000	48
Foxborough,	4,136	322,000	78	Milford and Hopedale.	16,248	987,000	61
Framingham,	17,033	1,111,000	65	Millbury,	5,653	334,000	59
Franklin,	6,497	513,000	79	Millis,	1,485	61,000	41
Gardner,	16,971	862,000	51	Nantucket,[1]	2,797	271,000	97
Gloucester,	22,947	1,567,000	68	Natick,	10,907	669,000	61
Grafton,	6,887	226,000	33	Needham,	7,012	450,000	64
Greenfield,	15,462	1,614,000	104	New Bedford,	121,217	10,085,000	83
Groton,	2,185	120,000	55	Newburyport,	15,618	1,339,000	86
Groveland,	2,650	33,000	13	Newton,	46,054	3,687,000	80
Haverhill,	53,884	6,031,000	112	North Andover,	6,265	371,000	59
Holliston,	2,707	119,000	44	North Attleborough,	9,238	503,000	54
Holyoke,	60,203	7,154,000	119	North Brookfield,	2,610	268,000	103
Hudson,	7,607	366,000	48	Norton,	2,374	189,000	80
Ipswich,	6,201	383,000	62	Norwood,	12,627	1,191,000	94
Lancaster,	2,461	81,000	33	Oak Bluffs,	1,047	189,000	181
Lawrence,	94,270	4,624,000	49	Orange,	5,393	150,000	28
Lenox,	2,691	303,000	113	Peabody,	19,552	3,967,000	203
Lincoln,	1,042	221,000	212	Pepperell,	2,468	164,000	66

[1] Does not include supply at Siasconset.

Consumption of Water in Various Cities and Towns in 1920 — Concluded.

City or Town.	Population, Census of 1920.	Average Daily Consumption.		City or Town.	Population, Census of 1920.	Average Daily Consumption.	
		Gallons.	Gallons per Inhabitant.			Gallons.	Gallons per Inhabitant.
Pittsfield,	41,763	5,926,000	142	Tisbury,	1,275	136,000	107
Plainville,	1,365	26,000	19	Uxbridge,	5,384	279,000	52
Plymouth,	13,045	1,419,000	109	Wakefield,	13,025	620,000	48
Provincetown,	4,246	310,000	73	Walpole,	5,446	893,000	164
Randolph and Holbrook.	7,917	531,000	67	Waltham,	30,915	1,960,000	63
Reading,	7,439	287,000	39	Ware,	8,525	514,000	60
Rockport,	3,878	312,000	80	Wareham,	4,415	186,000	42
Salem,	42,529	5,700,000	134	Webster,	13,258	708,000	53
Salisbury,	1,701	100,000	59	Wellesley,	6,224	536,000	86
Scituate,	2,534	349,000	138	West Brookfield,	1,281	23,000	18
Sharon,	2,467	207,000	84	Westfield,	18,604	2,254,000	121
Shirley,	2,260	93,000	41	Westford,	3,170	143,000	45
Shrewsbury,	3,708	94,000	25	Weston,	2,282	159,000	70
Southbridge,	14,245	916,000	64	Weymouth,	15,057	1,464,000	97
Springfield,	129,614	12,520,000	97	Whitman,	7,147	244,000	34
Stockbridge,	1,764	260,000	147	Woburn,	16,574	2,104,000	127
Stoughton,	6,865	423,000	62	Worcester,	179,754	16,517,000	92
Taunton,	37,137	3,395,000	91	Wrentham,	2,808	89,000	32

Rainfall.

The normal yearly rainfall in Massachusetts as deduced from long continued observations in various parts of the State is 44.60 inches. The average rainfall for the year 1920 in these places was 49.67, an excess of 5.07 inches over the normal. There was an excess of precipitation in the months of February, March, April, May, June, September, November and December, and a deficiency in the other four months of the year. The greatest excess in any month occurred in June, when the average rainfall was 6.21 inches, or 2.93 inches greater than the normal, and the greatest deficiency occurred in October, when the average rainfall was 1.36 inches, or 2.37 inches less than the normal.

The following table gives the normal rainfall in the State for each month as deduced from observations at various places for a long

period of years, together with the average rainfall at those places for each month during the year 1920, and the departure from the normal: —

Month.	Normal Rainfall (Inches).	Rainfall in 1920 (Inches).	Excess or Deficiency in 1920 (Inches).	Month.	Normal Rainfall (Inches).	Rainfall in 1920 (Inches).	Excess or Deficiency in 1920 (Inches).
January,	3.74	2.92	—.82	August,	4.21	3.18	—1.03
February,	3.69	5.72	+2.03	September,	3.50	4.59	+1.09
March,	3.94	3.98	+.04	October,	3.73	1.36	—2.37
April,	3.60	5.37	+1.77	November,	3.82	4.96	+1.14
May,	3.66	3.94	+.28	December,	3.68	4.77	+1.09
June,	3.28	6.21	+2.93	Totals,	44.60	49.67	+5.07
July,	3.75	2.67	—1.08				

Flow of Streams.

Sudbury River.

The average flow of the Sudbury River during the year 1920 was 1,239,000 gallons per day per square mile of drainage area, or about 24 per cent in excess of the normal flow for the past forty-six years. The flow was above the normal in the months of March, April, May, June, July and December, but less than the normal in the other six months of the year. The greatest excess occurred in the month of March, and the greatest deficiency in the month of February. The average flow for the driest six months, June to November, inclusive, was 360,000 gallons per day per square mile, or about 5 per cent below the normal flow for that period during the past forty-six years.

In order to show the relation between the flow of the Sudbury River during each month of the year 1920 and the normal flow of that stream, as deduced from observations during forty-six years, from 1875 to 1920, inclusive, the following table has been prepared. The drainage area of the Sudbury River above the point of measurement is 75.2 square miles.

Table showing the Average Daily Flow of the Sudbury River for Each Month in the Year 1920, in Cubic Feet per Second per Square Mile of Drainage Area, and in Million Gallons per Day per Square Mile of Drainage Area; also, Departure from the Normal Flow.

Month.	Normal Flow.		Actual Flow in 1920.		Excess or Deficiency.	
	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.
January,	1.761	1.138	.483	.312	—1.278	—.826
February,	2.509	1.622	1.149	.743	—1.360	—.879
March,	4.245	2.744	8.033	5.192	+3.788	+2.448
April,	3.078	1.990	4.503	2.911	+1.425	+.921
May,	1.680	1.086	2.856	1.846	+1.176	+.760
June,	.787	.509	2.625	1.696	+1.838	+1.187
July,	.284	.184	.439	.284	+.155	+.100
August,	.351	.227	—.061	—.039	—.412	—.266
September,	.355	.230	.099	.064	—.256	—.166
October,	.614	.397	—.040	—.026	—.654	—.423
November,	1.134	.733	1.035	.669	—.099	—.064
December,	1.510	.954	1.857	1.200	+.347	+.246
Average for whole year,	1.518	.981	1.917	1.239	+.399	+.258

The following table gives the rainfall upon the Sudbury River watershed and the total yield expressed in inches in depth upon the watershed (inches of rainfall collected) for each of the past five years, from 1916 to 1920, inclusive, together with the average for a period of forty-six years, from 1875 to 1920: —

Rainfall, in Inches, received and collected on the Sudbury River Drainage Area.

Month.	1916.			1917.			1918.		
	Rainfall.	Rainfall collected.	Per Cent collected.	Rainfall.	Rainfall collected.	Per Cent collected.	Rainfall.	Rainfall collected.	Per Cent collected.
January,	1.53	1.680	109.8	3.50	.909	25.9	3.47	.486	14.0
February,	5.91	2.262	38.2	2.68	1.216	45.5	3.58	2.914	81.3
March,	4.16	3.245	78.1	4.96	3.940	79.4	2.50	3.896	156.2
April,	4.19	5.243	125.1	2.41	2.425	100.5	4.43	2.530	57.1

Rainfall, in Inches, received and collected on the Sudbury River Drainage Area — Concluded.

Month.	1916.			1917.			1918.		
	Rainfall.	Rainfall collected.	Per Cent collected.	Rainfall.	Rainfall collected.	Per Cent collected.	Rainfall.	Rainfall collected.	Per Cent collected.
May,	3.43	2.567	74.9	4.93	2.632	53.4	1.16	1.141	98.8
June,	4.77	2.068	43.4	4.23	1.802	42.7	3.65	.319	8.7
July,	5.17	1.044	20.2	1.11	.076	6.8	4.07	.171	4.2
August,	2.01	.139	6.9	6.40	.361	5.6	1.61	—.096	—6.0
September,	1.80	.044	2.5	1.52	.100	6.6	8.60	1.100	12.8
October,	1.49	—.009	—.6	5.65	.860	15.2	1.04	.490	47.0
November,	2.28	.189	8.3	1.31	.757	57.6	2.75	.843	30.7
December,	3.22	.562	17.4	2.81	.678	24.2	3.68	1.673	45.5
Totals and averages,	39.96	19.034	47.6	41.51	15.756	38.0	40.54	15.467	38.2

Month.	1919.			1920.			Mean for Forty-six Years, 1875-1920.		
	Rainfall.	Rainfall collected.	Per Cent collected.	Rainfall.	Rainfall collected.	Per Cent collected.	Rainfall.	Rainfall collected.	Per Cent collected.
January,	3.52	2.329	66.1	3.26	.556	17.1	4.02	2.031	50.5
February,	3.40	1.477	43.4	6.49	1.239	19.1	4.15	2.635	63.5
March,	4.79	4.916	102.7	4.45	9.262	207.9	4.33	4.894	112.9
April,	2.93	2.957	101.0	5.19	5.017	96.6	3.58	3.435	95.9
May,	4.60	2.301	50.0	3.45	3.292	95.6	3.31	1.936	58.6
June,	1.86	.193	10.4	6.67	2.929	43.9	3.15	.878	27.8
July,	5.47	.533	9.8	2.04	.506	24.9	3.64	.328	9.0
August,	3.75	.164	4.4	1.78	—.070	—4.0	3.81	.405	10.6
September,	5.28	1.232	23.3	3.53	.110	3.1	3.42	.396	11.6
October,	2.16	.498	23.1	1.01	—.046	—4.6	3.67	.708	19.3
November,	5.90	2.202	37.3	5.68	1.154	20.3	3.75	1.265	33.8
December,	1.98	1.952	98.6	5.11	2.141	41.9	3.79	1.702	44.9
Totals and averages,	45.64	20.754	45.5	48.66	26.090	53.6	44.62	20.613	46.2

The following table gives the record of the yield of the Sudbury River watershed for each of the past five years and the mean for forty-six years, the flow being expressed in gallons per day per square mile of watershed: —

Yield of the Sudbury River Drainage Area in Gallons per Day per Square Mile.[1]

Month.	1916.	1917.	1918.	1919.	1920.	Mean for Forty-six Years, 1875-1920.
January,	942,000	510,000	273,000	1,306,000	312,000	1,138,000
February,	1,356,000	755,000	1,809,000	917,000	743,000	1,622,000
March,	1,820,000	2,209,000	2,187,000	2,759,000	5,192,000	2,744,000
April,	3,037,000	1,405,000	1,466,000	1,713,000	2,911,000	1,990,000
May,	1,439,000	1,476,000	639,000	1,290,000	1,846,000	1,086,000
June,	1,198,000	1,044,000	185,000	112,000	1,696,000	509,000
July,	585,000	43,000	96,000	299,000	284,000	184,000
August,	78,000	202,000	—54,000	92,000	—39,000	227,000
September,	26,000	58,000	637,000	713,000	64,000	230,000
October,	—5,000	482,000	274,000	279,000	—26,000	397,000
November,	110,000	438,000	489,000	1,275,000	669,000	733,000
December,	315,000	380,000	938,000	1,095,000	1,200,000	954,000
Average for whole year,	904,000	750,000	736,000	988,000	1,239,000	981,000
Average for driest six months.	186,000	267,000	269,000	458,000	360,000	378,000

[1] The drainage area of the Sudbury River used in making up these records included water surfaces amounting to about 2 per cent of the whole area from 1875 to 1878, inclusive, subsequently increasing by the construction of storage reservoirs to about 3 per cent in 1879, to 3.5 per cent in 1885, to 4 per cent in 1894, and to 6.5 per cent in 1898. The drainage area also contains extensive areas of swampy land, which, though covered with water at times, are not included in the above percentages of water surfaces.

Nashua River.

The average flow of the South Branch of the Nashua River at the outlet of the Wachusett Reservoir, Clinton, during the year 1920 was 1,629,000 gallons per day per square mile of drainage area, or 50 per cent in excess of the normal flow for the past twenty-four years. The flow was greater than the normal in the months of March, April, May, June, July, September, November and December, and less than the normal in the other four months of the year. The greatest excess occurred in the month of March, and the greatest deficiency in the month of February. The average flow for the driest six months, June to November, inclusive, was 870,000 gallons per day per square mile, or about 59 per cent in excess of the normal flow for that period during the past twenty-four years.

In order to show the relation between the flow of the Nashua River during each month of the year 1920 and the normal flow of that stream as deduced from observations during twenty-four years, 1897 to 1920, inclusive, the following table has been prepared. The drainage area of the Nashua River above the point of measurement was 119 square miles from 1897 to 1907, and 118.19 square miles from 1908 to 1913, inclusive. Since Jan. 1, 1914, the city of Worcester has been diverting water from 9.35 square miles of this drainage area for the supply of that city, leaving the net drainage area 108.84 square miles. In the calculations of yield, allowance has been made for water overflowing from the Worcester area.

Table showing the Average Daily Flow of the South Branch of the Nashua River for Each Month in the Year 1920, in Cubic Feet per Second per Square Mile of Drainage Area, and in Million Gallons per Day per Square Mile of Drainage Area; also, Departure from the Normal Flow.

Month.	Normal Flow.		Actual Flow in 1920.		Excess or Deficiency.	
	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.
January,	1.798	1.162	1.000	.646	—.798	—.516
February,	2.104	1.360	1.122	.725	—.982	—.635
March,	4.122	2.664	7.248	4.685	+3.126	+2.021
April,	3.334	2.155	5.413	3.498	+2.079	+1.343
May,	1.948	1.259	3.205	2.071	+1.257	+.812
June,	1.256	.812	2.974	1.922	+1.718	+1.110
July,	.686	.443	1.252	.809	+.566	+.366
August,	.628	.406	.506	.327	—.122	—.079
September,	.571	.369	.835	.540	+.264	+.171
October,	.742	.480	.634	.409	—.108	—.071
November,	1.203	.777	2.013	1.301	+.810	+.524
December,	1.815	1.173	4.007	2.590	+2.192	+1.417
Average for whole year,	1.682	1.087	2.521	1.629	+.839	+.542

The following table gives the rainfall upon the Nashua River watershed and the total yield expressed in inches in depth upon the watershed (inches of rainfall collected) for each of the past five years, 1916 to 1920, inclusive, together with the average for the past twenty-four years: —

Rainfall, in Inches, received and collected on the Nashua River Drainage Area.

Month.	1916.			1917.			1918.		
	Rainfall.	Rainfall collected.	Per Cent collected.	Rainfall.	Rainfall collected.	Per Cent collected.	Rainfall.	Rainfall collected.	Per Cent collected.
January,	1.60	2.346	146.7	3.37	1.224	36.3	2.97	.864	29.1
February,	5.98	3.030	50.7	3.05	1.476	48.3	4.25	3.260	76.6
March,	3.32	3.374	101.5	4.21	4.409	104.8	2.24	4.614	206.0
April,	3.65	5.696	156.0	1.80	2.535	140.6	3.47	2.775	80.0
May,	3.34	3.028	90.7	3.89	2.350	60.5	1.07	1.201	112.8
June	6.57	3.546	53.9	4.47	2.122	47.4	4.57	.902	19.8
July,	5.66	1.937	34.2	1.22	.471	38.8	2.80	.499	17.8
August,	1.72	.506	29.5	4.46	.552	12.4	2.82	.284	10.1
September,	4.21	.506	12.0	1.20	.144	12.0	7.18	1.041	14.5
October,	1.42	.250	17.6	6.03	.990	16.4	1.58	.609	38.6
November,	3.15	.554	17.6	1.25	.540	43.1	3.08	1.004	32.6
December,	2.81	.820	29.2	2.31	.694	30.0	3.74	1.884	50.4
Totals and averages	43.43	25.593	58.9	37.26	17.507	47.0	39.77	18.937	47.6

Month.	1919.			1920.			Mean for Twenty-four Years, 1897-1920.		
	Rainfall.	Rainfall collected.	Per Cent collected.	Rainfall.	Rainfall collected.	Per Cent collected.	Rainfall.	Rainfall collected.	Per Cent collected.
January,	3.23	2.392	74.1	3.17	1.153	36.4	3.59	2.073	57.6
February,	3.51	1.279	36.5	6.26	1.210	19.3	3.89	2.208	56.7
March,	5.27	5.621	106.7	4.26	8.356	196.0	4.09	4.752	116.1
April,	2.57	2.954	115.0	6.13	6.031	98.4	3.76	3.721	99.0
May,	6.06	3.931	64.9	4.01	3.695	92.1	3.43	2.246	65.6
June,	2.01	.798	39.6	6.07	3.317	54.6	3.78	1.400	37.0
July,	5.00	.713	14.3	4.33	1.443	33.3	4.09	.791	19.3
August,	4.17	.467	11.2	2.91	.584	20.1	4.09	.724	17.7
September,	6.78	1.887	27.8	6.39	.931	14.6	3.84	.638	16.6
October,	2.35	.884	37.6	.63	.731	116.1	3.23	.856	26.5
November,	6.01	3.168	52.7	5.49	2.246	40.9	3.47	1.342	38.6
December,	2.09	2.305	110.4	6.01	4.619	76.9	4.06	2.093	51.5
Totals and averages,	49.05	26.399	53.8	55.66	34.316	61.7	45.32	22.844	50.4

The following table gives a record of the yield of the Nashua River for each of the past five years and the mean for the past twenty-four years, the flow being expressed in gallons per day per square mile of watershed: —

Yield of the Nashua River Drainage Area in Gallons per Day per Square Mile.[1]

Month.	1916.	1917.	1918.	1919.	1920.	Mean for Twenty-four Years, 1897-1920.
January,	1,315,000	686,000	484,000	1,341,000	646,000	1,162,000
February,	1,816,000	916,000	2,024,000	794,000	725,000	1,360,000
March,	1,891,000	2,472,000	2,590,000	3,155,000	4,685,000	2,664,000
April,	3,300,000	1,468,000	1,608,000	1,711,000	3,498,000	2,155,000
May,	1,697,000	1,317,000	673,000	2,204,000	2,071,000	1,259,000
June,	2,054,000	1,229,000	523,000	462,000	1,922,000	812,000
July,	1,086,000	264,000	280,000	400,000	809,000	443,000
August,	284,000	309,000	159,000	262,000	327,000	406,000
September,	294,000	84,000	603,000	1,093,000	540,000	369,000
October,	140,000	555,000	341,000	495,000	409,000	480,000
November,	321,000	313,000	582,000	1,835,000	1,301,000	777,000
December,	460,000	389,000	1,056,000	1,292,000	2,590,000	1,173,000
Average for whole year.	1,215,000	834,000	902,000	1,257,000	1,629,000	1,087,000
Average for driest six months.	432,000	320,000	412,000	752,000	870,000	546,000

[1] The drainage area used in making up these records included water surfaces amounting to 2.2 per cent of the whole area from 1897 to 1902, inclusive, to 2.4 per cent in 1903, to 3.6 per cent in 1904, to 4.1 per cent in 1905, to 5.1 per cent in 1906, to 6 per cent in 1907, to 7 per cent in 1908, 1909 and 1910, to 6.5 per cent in 1911, to 6.8 per cent in 1912, to 7 per cent in 1913, to 7.4 per cent in 1914 and 1915, to 7.6 per cent in 1916, to 7.4 per cent in 1917 and 1918, and to 7.5 per cent in 1919 and 1920.

Merrimack River.

The flow of the Merrimack River has been measured for many years at Lawrence, above which place the river has a total drainage area of 4,663 square miles, which includes 118[1] square miles on the South Branch of the Nashua River, 75 square miles on the Sudbury River, and 18 square miles tributary to Lake Cochituate, or a combined area of 211[1] square miles from which water is drawn at the present time for the supply of the Metropolitan Water District. The flow as measured at Lawrence includes the water wasted from these three drainage areas, the aggregate quantity of which, in the wet months of the year, is considerable, but which becomes very small in

[2] Including 9.35 square miles from which water is drawn for the supply of the city of Worcester.

the dry months. Records of the quantity of water wasted have been kept by the Boston Water Board and by the Metropolitan Water and Sewerage Board, and these quantities have been deducted from the flow as measured at Lawrence. In presenting the record of the flow of the river, these three drainage areas have been deducted from the total above Lawrence, so that the net drainage area above that point was 4,567 square miles in 1880, 4,570 square miles in the years 1881 to 1897, inclusive, and 4,452 square miles since the latter year.

The average flow of the Merrimack River during the year 1920 amounted to 1.98 cubic feet per second, or 1,280,000 gallons per day, per square mile of drainage area, or 35 per cent in excess of the normal flow for the past forty-one years for which records are available. The flow was in excess of the normal in the months of March, April, May, June, July, August, September, October and December, and less than the normal in the other three months of the year.

In order to show the relation between the flow of this stream during each month of the year 1920 and the normal flow as deduced from observations during forty-one years, from 1880 to 1920, inclusive, the following table has been prepared: —

Table showing the Average Monthly Flow of the Merrimack River at Lawrence for the Year 1920, in Cubic Feet per Second per Square Mile of Drainage Area; also, Departure from the Normal Flow.

Month.	Normal Flow, 1880-1920.	Actual Flow in 1920.	Excess or Deficiency.
January,	1.267	.570	—.697
February,	1.382	.618	—.764
March,	2.747	4.082	+1.335
April,	3.457	6.002	+2.545
May,	2.218	3.545	+1.327
June,	1.266	1.607	+.341
July,	.741	.746	+.005
August,	.677	.678	+.001
September,	.652	.680	+.028
October,	.814	1.051	+.237
November,	1.117	.921	—.196
December,	1.269	3.258	+1.989
Average for whole year,	1.467	1.980	+.513

The following table gives the record of the flow of the Merrimack River at Lawrence for each of the past five years and the mean for forty-one years, the flow being expressed in cubic feet per second per square mile of drainage area: —

Flow of the Merrimack River at Lawrence in Cubic Feet per Second per Square Mile.

Month.	1916.	1917.	1918.	1919.	1920.	Mean for Forty-one Years, 1880-1920.
January,	1.527	1.023	.466	1.314	.570	1.267
February,	1.674	.770	.819	.872	.618	1.382
March,	1.735	2.316	1.983	3.383	4.082	2.747
April,	4.323	3.242	3.337	2.542	6.002	3.457
May,	2.733	2.124	1.540	2.741	3.545	2.218
June,	3.101	3.037	.757	1.007	1.607	1.266
July,	1.531	1.024	.553	.539	.746	.741
August,	.924	.629	.470	.401	.678	.677
September,	.972	.549	.847	.653	.680	.652
October,	.798	.613	.991	.699	1.051	.814
November,	.743	.882	1.126	1.648	.921	1.117
December,	1.154	.569	1.492	1.331	3.258	1.269
Average for whole year.	1.768	1.398	1.198	1.427	1.980	1.467
Average for driest six months.	1.020	.711	.791	.825	.947	.878

Sudbury, Nashua and Merrimack Rivers.

The following table shows the weekly fluctuations during the year 1920 in the flow of the Sudbury River at Framingham, the South Branch of the Nashua River at the outlet of the Wachusett Reservoir, Clinton, and the Merrimack River at Lawrence. The flow of these streams, particularly that of the Sudbury River and of the South Branch of the Nashua River, serves to indicate the flow of other streams in eastern Massachusetts. The area of the Sudbury River watershed is 75.2 square miles, of the South Branch of the Nashua River 118.19 square miles, and of the Merrimack River 4,452 square miles.

Table showing the Average Weekly Flow of the Sudbury, South Branch of the Nashua and the Merrimack Rivers for the Year 1920, in Cubic Feet per Second per Square Mile of Drainage Area.

Week ending Sunday —	Flow in Cubic Feet per Second per Square Mile.			Week ending Sunday —	Flow in Cubic Feet per Second per Square Mile.		
	Sudbury River.	South Branch, Nashua River.	Merrimack River.		Sudbury River.	South Branch, Nashua River.	Merrimack River.
Jan. 4,	.488	.916	.669	July 4,	1.529	1.633	.976
11,	.426	1.175	.575	11,	.703	.935	.779
18,	.293	.987	.573	18,	.142	1.318	.701
25,	.775	1.033	.560	25,	.392	1.740	.741
Feb. 1,	.683	.885	.559	Aug. 1,	—.072	.538	.630
8,	1.425	1.511	.578	8,	—.306	.343	.533
15,	.828	1.134	.641	15,	.202	.996	.678
22,	1.260	1.068	.683	22,	.032	.512	.919
29,	.881	.858	.635	29,	.206	.219	.651
Mar. 7,	2.285	1.813	.777	Sept. 5,	.185	.155	.514
14,	6.879	6.230	1.667	12,	.248	.703	.523
21,	11.949	9.042	5.010	19,	.000	.226	1.032
28,	12.517	11.188	6.335	26,	.092	.260	.640
Apr. 4,	7.809	8.368	8.148	Oct. 3,	.475	3.495	1.653
11,	4.989	5.399	5.783	10,	.006	.553	1.412
18,	3.536	4.131	5.669	17,	.119	.313	.727
25,	3.523	4.609	5.852	24,	.257	.364	.615
				31,	.149	.446	.653
May 2,	4.273	5.542	6.379				
9,	3.001	3.706	3.972	Nov. 7,	.275	.760	.983
16,	3.116	2.763	3.413	14,	.021	.304	.721
23,	2.800	4.318	2.748	21,	1.200	2.054	.754
30,	2.511	2.212	3.466	28,	2.666	4.968	1.198
June 6,	2.406	3.178	1.653	Dec. 5,	1.480	4.257	1.145
13,	1.857	1.937	1.916	12,	1.789	3.723	3.923
20,	3.479	4.650	1.440	19,	2.965	6.439	5.343
27,	3.150	2.539	1.663	26,	1.362	2.552	2.736

Sewerage and Sewage Disposal.

Notwithstanding the difficulty and cost of construction work during the past year, a considerable amount of essential sewerage work has been carried on by a number of municipalities.

At Andover a large extension has been made to the sewerage system to provide for the Shawsheen or Frye Village district, which is increasing very rapidly in population.

At Billerica the sewage disposal system has been materially increased in size, and at Northbridge an additional area of filter beds has been provided. At Brockton new works, comprising a series of large settling tanks and $1\frac{1}{2}$ acres of trickling filters, have been under construction during the year.

At Worcester the work of improving the sewerage system, required by the provisions of chapter 171 of the Special Acts of the year 1919, has been carried on during the year, and the amount of work done and

the expenditure made during 1920 comply fully with the requirements of the act.

The year has been a favorable one for the disposal of sewage into inland waters, especially running streams, on account of the excessive rainfall and the great quantity of water available for the dilution of the sewage.

The flow of streams has been the highest, judging from the measurements of the flow of the Nashua River, that has occurred probably for more than a quarter of a century; and the flow was not only greater than usual in the colder and wetter months of the year, but also was much higher than usual in the months which are warmer and usually dry, with the exception of August and October. The amount of pollution from cities and towns is constantly increasing, in a general way approximating the increase in the use of water, while the amount of manufacturing waste, though varying from time to time, also has a tendency to increase from one period of manufacturing activity to another. When dry seasons again occur, the effect of these increases will inevitably result in far worse conditions than have occurred under similar circumstances in the past, since little has been done for a number of years towards relieving streams from pollution by sewage or manufacturing waste.

These conditions, while favorable for the dilution of sewage discharged into streams, have been less favorable for the operation of sewage disposal works on account of the increase in the quantity of sewage requiring disposal. A number of the sewage disposal works of the State have already become inadequate, on account of the growth of the municipalities which they serve, for the proper care of all of the sewage requiring disposal. In a number of these cases, owing to the increased flow of sewage in the past year, considerable quantities of sewage have in many instances been discharged untreated into the streams. This condition has obtained at times at Pittsfield, Clinton, Spencer and Southbridge, among others, while, at the same time, municipalities which have adequate works for the treatment and purification of the sewage have found no difficulty in producing a very satisfactory effluent. This has been the case, for example, at Attleboro, Concord, Framingham, Hopedale, Hudson, Marlborough, North Attleborough, Northbridge, Norwood and Westborough. A new sewerage system has been introduced at Millis. This, when completed, will remove much of the excessive pollution from a stream in the valley of which is situated the well used as a source of water supply for the town.

The average results of analyses of samples of sewage and effluent and statistics concerning the more important sewage disposal works in the State are presented in the following tables: —

TABLE No. 1. — *Average Results of the Analyses of Monthly Samples of Sewage as received at the Disposal Works (Fats determined in about 60 Per Cent of the Samples).*

[Parts in 100,000.]

City or Town.	Residue on Evaporation.						Ammonia.				Chlorine.	Oxygen consumed.		Iron.		Nitrogen.	Fats.
	Total residue.			Loss on ignition.			Free.	Albuminoid.								Kjeldahl	
	Total.	Dissolved.	Suspended.	Total.	Dissolved.	Suspended.		Total.	Dissolved.	Suspended.		Unfiltered.	Filtered.	Unfiltered.	Filtered.		
Andover,	56.93	39.20	17.73	33.42	17.55	15.87	3.64	.95	.58	.37	6.98	6.71	3.07	.183	.070	1.71	10.85
Attleboro,[1]	45.50	38.13	7.37	17.87	11.53	6.34	2.31	.53	.34	.19	7.77	2.93	1.88	.192	.095	.89	–
Brockton,[2]	80.20	54.18	26.02	42.02	23.58	18.44	4.76	1.06	.63	.43	9.39	10.34	5.83	.350	.140	1.78	8.05
Clinton,[2]	158.45	81.42	77.03	97.16	37.02	60.14	4.52	1.59	.80	.79	6.80	16.29	7.25	1.037	.437	3.37	52.03
Concord,[1]	27.20	19.07	8.13	13.07	7.83	5.24	1.35	.37	.22	.15	3.73	2.79	1.43	–	–	.78	–
Easthampton,[3]	56.12	40.04	16.08	24.79	13.66	11.13	4.57	.67	.45	.22	5.56	6.54	3.40	.554	.088	1.13	–
Fitchburg,	57.30	33.78	23.52	26.12	14.05	12.07	2.28	.60	.35	.25	6.86	6.32	3.23	.860	.177	1.27	6.40
Framingham,[2]	83.96	51.13	32.83	43.44	22.24	21.20	3.76	1.55	1.02	.53	7.89	10.42	5.18	.329	.104	2.32	17.65
Franklin,[1]	38.90	26.77	12.13	22.73	13.63	9.10	3.47	.75	.49	.26	3.23	4.29	1.95	.147	.037	1.28	–
Gardner (Gardner area),[4]	79.47	46.93	32.54	46.40	20.40	26.00	10.11	3.47	2.48	.99	7.73	8.73	3.30	.223	.067	3.07	9.07
Gardner (Templeton area),	57.57	37.70	19.87	31.43	16.02	15.41	7.73	1.22	.73	.49	6.30	5.67	2.85	.220	.077	1.75	5.66
Hopedale,[1]	72.28	42.57	29.71	41.27	18.77	22.50	3.73	1.56	1.11	.45	6.10	9.53	4.19	–	–	2.58	–
Hudson,	101.16	75.80	25.36	50.00	30.33	19.67	6.18	1.91	1.23	.68	16.21	10.67	6.48	.304	.123	3.56	7.47
Leicester,[5]	27.90	22.20	5.70	12.20	10.05	2.15	1.31	.36	.21	.15	3.33	2.12	1.17	.142	.041	.73	–
Marion,	24.17	19.67	4.50	11.22	8.35	2.87	1.62	.35	.22	.13	3.19	2.51	1.47	.187	.060	.69	–
Marlborough,	61.20	39.03	22.17	33.48	15.58	17.90	3.26	.89	.50	.39	8.10	6.74	2.76	.484	.146	1.70	6.06
Milford,	61.58	50.13	11.45	28.22	19.29	8.93	3.59	.74	.39	.35	9.91	6.29	3.63	.255	.074	1.48	–
Natick,[2]	56.13	41.74	14.39	27.48	15.63	11.85	3.14	.50	.28	.22	8.42	4.31	2.29	.424	.090	1.23	3.92
North Attleborough,[1]	31.77	23.53	8.24	15.87	9.37	6.50	1.37	.45	.25	.20	4.28	2.62	1.46	.222	.089	.96	–
Northbridge,[1]	40.90	27.33	13.57	26.37	15.13	11.24	4.15	.84	.52	.32	3.27	5.75	3.70	–	–	1.57	–
Norwood,	100.15	78.41	21.74	39.30	23.59	15.71	2.57	.85	.47	.38	25.69	12.72	8.92	.334	.148	1.17	7.96
Pittsfield,[2]	39.51	35.07	4.44	16.22	14.13	2.09	2.46	.45	.31	.14	4.71	2.77	1.92	.142	.063	.87	2.69
Southbridge,[3]	55.64	35.40	20.24	30.68	15.64	15.04	4.05	.77	.40	.37	6.24	6.32	2.69	.354	.112	1.40	–
Spencer,[1]	34.00	26.97	7.03	18.50	13.87	4.63	2.93	.64	.44	.20	4.10	5.07	2.32	.233	.080	1.33	3.28
Stockbridge,[5]	30.60	29.25	1.35	13.15	12.40	.75	1.34	.29	.18	.11	2.28	2.52	2.03	–	–	.50	1.60
Westborough,	45.30	33.72	11.58	23.55	14.12	9.43	2.16	.71	.46	.25	5.21	5.11	3.10	.166	.073	1.22	6.54
Worcester (day),[3]	110.80	66.76	44.04	48.20	15.64	32.56	2.59	1.07	.63	.44	14.04	12.72	3.48	6.800	1.004	2.24	–
Worcester (night),[6]	82.40	57.40	25.00	32.17	16.28	15.89	1.62	.93	.53	.40	8.07	8.58	3.88	8.900	4.578	1.61	–

[1] Six samples. [2] At pumping station. [3] Five samples. [4] Three samples. [5] Four samples. [6] Seven samples.

TABLE NO. 2. — *Average Results of the Analyses of Monthly Samples of Sewage as applied to Filter Beds after Preliminary Treatment as indicated (Fats determined in about 60 Per Cent of the Samples).*

[Parts in 100,000.]

City or Town.	Form of Preliminary Treatment.	Residue on Evaporation.						Ammonia.				Chlorine.	Oxygen consumed.		Iron.		Kjeldahl Nitrogen.	Fats.
		Total residue.			Loss on ignition.				Albuminoid.									
		Total.	Dissolved.	Suspended.	Total.	Dissolved.	Suspended.	Free.	Total.	Dissolved.	Suspended.		Unfiltered.	Filtered.	Unfiltered.	Filtered.		
Andover,	Tank,	47.28	36.29	10.99	23.67	14.40	9.27	4.17	.73	.46	.27	7.39	4.58	2.61	.139	.075	1.21	6.42
Attleboro,[1]	None,	45.50	38.13	7.37	17.87	11.53	6.34	2.31	.53	.34	.19	7.77	2.93	1.88	.192	.095	.89	–
Brockton,[2]	None,	80.20	54.18	26.02	42.02	23.58	18.44	4.76	1.06	.63	.43	9.39	10.34	5.83	.350	.140	1.78	8.05
Clinton,	Basins,	71.07	58.56	12.51	35.60	27.27	8.33	3.17	.68	.48	.20	5.74	7.37	5.67	1.309	.980	1.42	10.62
Concord,[1]	None,	27.20	19.07	8.13	13.07	7.83	5.24	1.35	.37	.22	.15	3.73	2.79	1.43	–	–	.78	–
Easthampton,[3]	Tanks,	57.16	38.84	18.32	29.32	14.12	15.20	3.06	.85	.48	.37	5.90	6.72	3.36	.190	.068	1.40	–
Fitchburg,	Imhoff tanks,	38.83	33.03	5.80	16.13	12.73	3.40	2.25	.38	.26	.12	6.49	4.07	2.81	.418	.197	.92	3.39
Framingham,[2]	None,	83.96	51.13	32.83	43.44	22.24	21.20	3.76	1.55	1.02	.53	7.89	10.42	5.18	.329	.104	2.32	17.65
Franklin,[1]	Tanks,	22.83	19.70	3.13	8.93	7.57	1.36	1.88	.21	.14	.07	3.28	1.41	1.04	.124	.066	.50	–
Gardner (Gardner area),[4]	None,	79.47	46.93	32.54	46.40	20.40	26.00	10.11	3.47	2.48	.99	7.73	8.73	3.30	.223	.067	3.07	9.07
Gardner (Templeton area),	Tanks,	36.28	31.00	5.28	14.30	10.47	3.83	3.55	.50	.32	.18	7.36	3.00	1.92	.159	.083	.70	2.57
Hopedale,[1]	Tanks,	50.37	34.50	15.87	25.70	15.40	10.30	6.39	.86	.49	.37	7.95	5.18	3.02	–	–	1.38	–
Hudson,	Tanks,	54.91	48.33	6.58	23.78	19.00	4.78	4.15	.65	.41	.24	10.10	4.66	3.23	.179	.096	1.20	3.67
Leicester,[5]	Tanks,	27.90	22.20	5.70	12.20	10.05	2.15	1.31	.36	.21	.15	3.33	2.12	1.17	.142	.041	.73	–
Marion,	None,	24.17	19.67	4.50	11.22	8.35	2.87	1.62	.35	.22	.13	3.19	2.51	1.47	.187	.060	.69	–
Marlborough,	Tanks,	47.25	39.33	7.92	21.20	15.20	6.00	4.00	.72	.52	.20	7.70	3.94	2.46	.415	.209	1.06	4.38
Milford,	Tanks,	50.06	44.26	5.80	20.38	16.58	3.80	3.49	.58	.40	.18	9.08	4.49	3.15	.242	.094	1.22	–
Natick,[2]	None,	56.13	41.74	14.39	27.48	15.63	11.85	3.14	.50	.28	.22	8.42	4.31	2.29	.424	.090	1.23	3.92
North Attleborough,[1]	Tanks,	24.27	21.48	2.79	8.50	7.77	.73	1.50	.21	.14	.07	4.92	1.64	1.13	.155	.071	.57	–
Northbridge,[1]	Tanks,	19.87	16.76	3.11	8.30	6.73	1.57	2.02	.25	.15	.10	2.48	1.65	1.15	–	–	.60	–
Norwood,	Tank,	70.20	60.90	9.30	23.72	18.36	5.36	2.66	.54	.17	.37	18.49	6.99	5.46	.360	.144	1.06	4.16
Pittsfield,[2]	None,	39.51	35.07	4.44	16.22	14.13	2.09	2.46	.45	.31	.14	4.71	2.77	1.92	.142	.063	.87	2.69
Southbridge,[1]	Tanks,	44.47	33.47	11.00	21.93	13.17	8.76	3.86	.53	.32	.21	6.98	3.65	2.02	.234	.118	1.11	–
Spencer,[1]	None,	34.00	26.97	7.03	18.50	13.87	4.63	2.93	.64	.44	.20	4.10	5.07	2.32	.233	.080	1.33	3.28
Stockbridge,[5]	None,	30.60	29.25	1.35	13.15	12.40	.75	1.34	.29	.18	.11	2.28	2.52	2.03	–	–	.50	1.60
Westborough,	None,	45.30	33.72	11.58	23.55	14.12	9.43	2.16	.71	.46	.25	5.21	5.11	3.10	.166	.073	1.22	6.54
Worcester (day),[3]	Tanks,	110.80	66.76	44.04	48.20	15.64	32.56	2.59	1.07	.63	.44	14.04	12.72	3.48	6.800	1.004	2.24	–

[1] Six samples. [2] At pumping station. [3] Five samples. [4] Three samples. [5] Four samples.

TABLE No. 3. — *Efficiency of Settling Tanks and Other Forms of Preliminary Treatment as indicated by the Foregoing Tables.*

[Parts in 100,000.]

City or Town.	Form of Preliminary Treatment.	Suspended Solids.			Total Albuminoid Ammonia.			Oxygen consumed.			Fats.[1]			Chlorine.	
		Raw Sewage.	Settled or Treated Sewage.	Per Cent removed.	Raw Sewage.	Settled or Treated Sewage.	Per Cent removed.	Raw Sewage.	Settled or Treated Sewage.	Per Cent removed.	Raw Sewage.	Settled or Treated Sewage.	Per Cent removed.	Raw Sewage.	Settled or Treated Sewage.
Andover,	Tank,	17.73	10.99	38	.95	.73	23	6.71	4.58	32	10.85	6.42	41	6.98	7.39
Clinton,	Basins,	77.03	12.51	84	1.59	.68	57	16.29	7.37	55	52.03	10.62	80	6.80	5.74
Easthampton,	Tanks,	16.08	18.32	–	.67	.85	–	6.54	6.72	–	–	–	–	5.56	5.90
Fitchburg,	Imhoff tanks,	23.52	5.80	75	.60	.38	37	6.32	4.07	36	6.40	3.39	47	6.86	6.49
Franklin,	Tanks,	12.13	3.13	74	.75	.21	72	4.29	1.41	67	–	–	–	3.23	3.28
Gardner (Templeton area),	Tanks,	19.87	5.28	73	1.22	.50	59	5.67	3.00	47	5.66	2.57	55	6.30	7.36
Hopedale,	Tanks,	29.71	15.87	47	1.56	.86	45	9.53	5.18	46	–	–	–	6.10	7.95
Hudson,	Tanks,	25.36	6.58	74	1.91	.65	66	10.67	4.66	56	7.47	3.67	51	16.21	10.10
Marlborough,	Tanks,	22.17	7.92	64	.89	.72	19	6.74	3.94	42	6.06	4.38	28	8.10	7.70
Milford,	Tanks,	11.45	5.80	49	.74	.58	22	6.29	4.49	29	–	–	–	9.91	9.08
North Attleborough,	Tanks,	8.24	2.79	66	.45	.21	53	2.62	1.64	37	–	–	–	4.28	4.92
Northbridge,	Tanks,	13.57	3.11	77	.84	.25	70	5.75	1.65	71	–	–	–	3.27	2.48
Norwood,	Tank,	21.74	9.30	57	.85	.54	36	12.72	6.99	45	7.96	4.16	48	25.69	18.49
Southbridge,	Tanks,	20.24	11.00	46	.77	.53	31	6.32	3.65	42	–	–	–	6.24	6.98
Worcester,	Chemical precipitation.	25.00	5.21	79	.93	.27	71	8.58	2.81	67	–	–	–	8.07	6.53

[1] Fats determined in about 60 per cent of the samples.

TABLE NO. 4. — *Average Results of the Analyses of Monthly Samples of Sewage applied to the Trickling Filters at Brockton and Fitchburg, and of their Effluents, etc. Per Cents removed, etc.*

BROCKTON.

[Parts in 100,000.]

	Residue on Evaporation.						Ammonia.				Chlorine.	Nitrogen as —		Oxygen consumed.		Kjeldahl Nitrogen.	Fats.	Remarks.
	Total residue.			Loss on ignition.				Albuminoid.										
	Total.	Dissolved.	Suspended.	Total.	Dissolved.	Suspended.	Free.	Total.	Dissolved.	Suspended.		Nitrates.	Nitrites.	Unfiltered.	Filtered.			
Sewage as applied to trickling filter.	80.20	54.18	26.02	42.02	23.58	18.44	4.76	1.06	.63	.43	9.39	–	–	10.34	5.83	1.78	8.05	The trickling filter has an area of .5 of an acre and a depth of 5.5 to 6.5 feet of crushed stone from 1.5 to 3 inches in size. The average rate of operation was about 1,580,000 gallons per acre per day. New works under construction.
Effluent from trickling filter,	38.66	31.52	7.14	16.80	11.48	5.32	2.36	.40	.17	.23	6.63	.8533	.0350	4.03	1.94	.84	1.94	
Per cent removed, . .	52	42	73	60	51	71	50	62	73	47	29	–	–	61	67	53	76	
Settled effluent from trickling filter.	39.66	33.56	6.10	15.08	12.44	2.64	2.65	.33	.21	.12	7.35	.8227	.0303	3.41	2.16	.76	1.95	
Per cent removed by tank, .	–	–	15	10	–	50	–	18	–	48	–	–	–	15	–	10	–	Period of sedimentation averaged about one and one-half hours. Tank cleaned once per week.
Per cent removed by trickling filter and settling tank.	50	38	77	64	47	86	44	69	67	72	22	–	–	67	63	57	76	

TABLE NO. 4. — *Average Results of the Analyses of Monthly Samples of Sewage applied to the Trickling Filters at Brockton and Fitchburg, and of their Effluents, etc. Per Cents removed, etc.* — Concluded.

FITCHBURG.

[Parts in 100,000.]

	Residue on Evaporation.						Ammonia.				Chlorine.	Nitrogen as —		Oxygen consumed.		Kjeldahl Nitrogen.	Fats.	Remarks.
	Total residue.			Loss on ignition.				Albuminoid.										
	Total.	Dissolved.	Suspended.	Total.	Dissolved.	Suspended.	Free.	Total.	Dissolved.	Suspended.		Nitrates.	Nitrites.	Unfiltered.	Filtered.			
Imhoff tank effluent as applied to trickling filter.	38.83	33.03	5.80	16.13	12.73	3.40	2.25	.38	.26	.12	6.49	–	–	4.07	2.81	.92	3.39	The trickling filter has an area of 2.14 acres and a depth of 10 feet of stone from 1 to 3 inches in size.
Effluent from trickling filter,	34.10	29.42	4.68	14.30	12.07	2.23	.77	.23	.14	.09	6.30	.9940	.0382	1.78	1.29	.48	–	The average rate of operation was about 1,616,000 gallons per acre per day for area used (1.86 acres).
Per cent removed, . .	12	11	19	11	5	34	66	40	46	25	3	–	–	56	54	48	–	
Settled effluent from trickling filter as discharged to Nashua River.	32.75	29.85	2.90	12.72	10.98	1.74	.80	.20	.13	.07	6.24	.9648	.0411	1.64	1.24	.43	–	Period of sedimentation averaged about two hours. Tanks cleaned five times.
Per cent removed by tanks, .	4	–	38	11	9	22	–	13	7	22	1	–	–	8	4	10	–	
Per cent removed by trickling filter and settling tank.	16	10	50	21	14	49	64	47	50	42	4	–	–	60	56	53	–	

TABLE NO. 5. — *Average Results of the Analyses of Monthly Samples of Effluent from Sand Filters.*

[Parts in 100,000.]

CITY OR TOWN.	Free Ammonia.	Total Albuminoid Ammonia.	Chlorine.	NITROGEN AS —		Iron.
				Nitrates.	Nitrites.	
Andover,[1]	1.74	.1308	6.45	.3012	.0367	.458
BROCKTON,[1]	3.40	.1014	8.35	.1515	.0015	1.716
Clinton,[1]	1.85	.0822	4.66	.3035	.0024	2.283
Concord,[2]	.04	.0130	3.65	.7288	.0056	.015
Easthampton,[3]	1.36	.1204	4.60	.3300	.0279	1.070
Framingham,[1]	2.36	.1292	7.02	.3747	.0201	1.365
Franklin,[2]	1.05	.0514	3.23	.2667	.0050	.156
Gardner (Gardner area),[4]	1.34	.4333	5.83	4.5410	.0360	.273
Gardner (Templeton area),[1]	1.82	.3716	8.85	1.7768	.0639	.089
Hopedale,[1]	2.00	.1710	6.33	2.6586	.0169	.082
Hudson,	.92	.1227	10.34	1.3179	.0218	.202
Leicester,[4]	.55	.0564	2.58	.1983	.0129	.059
Marion,	.36	.0344	2.72	.6551	.0030	.049
MARLBOROUGH,[1]	.78	.0840	6.45	1.5182	.0102	.083
Milford,	2.02	.1002	7.06	.4415	.0114	.777
Natick,	2.22	.0907	7.47	.1833	.0047	.847
North Attleborough,[2]	.06	.0130	3.42	.5983	.0055	.016
Northbridge,[2]	.39	.0375	2.47	.5797	.0127	.182
Norwood,	1.06	.0751	13.11	.1759	.0199	.543
PITTSFIELD,[1]	.70	.0753	4.81	.6132	.0231	.201
Southbridge,[5]	2.02	.1191	5.30	.1694	.0005	1.642
Spencer,[2]	.16	.0214	3.15	.8753	.0005	.180
Stockbridge,[1]	.25	.0387	1.98	.4002	.0168	.170
Westborough,[1]	.97	.0892	4.57	.2741	.0127	.580
WORCESTER,[3]	1.87	.2360	11.12	1.0558	.0110	1.400

[1] Regular samples from two or more underdrains combined in one average.
[2] Six samples.
[3] Five samples.
[4] Four samples.
[5] Fourteen samples.

TABLE NO. 6. — *Efficiency of Sand Filters (Per Cent of Free and Albuminoid Ammonia removed).*

[Parts in 100,000.]

CITY OR TOWN.	FREE AMMONIA.			TOTAL ALBUMINOID AMMONIA.			CHLORINE.		Rate of Operation with Even Distribution (Gallons per Acre per Day).[1]
	Applied Sewage.	Effluent.	Per Cent removed.	Applied Sewage.	Effluent.	Per Cent removed.	Applied Sewage.	Effluent.	
Andover,	4.17	1.74	58	.73	.1308	82	7.39	6.45	68,000
BROCKTON,	4.76	3.40	29	1.06	.1014	90	9.39	8.35	55,000
Clinton,	3.17	1.85	42	.68	.0822	88	5.74	4.66	42,000
Concord,	1.35	.04	97	.37	.0130	96	3.73	3.65	124,000
Easthampton,	3.06	1.36	56	.85	.1204	86	5.90	4.60	–
Framingham,	3.76	2.36	37	1.55	.1292	92	7.89	7.02	60,000
Franklin,	1.88	1.05	44	.21	.0514	76	3.28	3.23	65,000
Gardner (Gardner area),	10.11	1.34	87	3.47	.4333	88	7.73	5.83	80,000
Gardner (Templeton area),	3.55	1.82	49	.50	.3716	26	7.36	8.85	
Hopedale,	6.39	2.00	69	.86	.1710	80	7.95	6.33	23,000
Hudson,	4.15	.92	78	.65	.1227	81	10.10	10.34	49,000
Leicester,	1.31	.55	58	.36	.0564	84	3.33	2.58	–
Marion,	1.62	.36	78	.35	.0344	90	3.19	2.72	76,000
MARLBOROUGH,	4.00	.78	80	.72	.0840	88	7.70	6.45	52,000
Milford,	3.49	2.02	42	.58	.1002	83	9.08	7.06	105,000
Natick,	3.14	2.22	29	.50	.0907	82	8.42	7.47	119,000
North Attleborough,	1.50	.06	96	.21	.0130	94	4.92	3.42	111,000
Northbridge,	2.02	.39	81	.25	.0375	85	2.48	2.47	49,000
Norwood,	2.66	1.06	60	.54	.0751	86	18.49	13.11	114,000
PITTSFIELD,	2.46	.70	72	.45	.0753	83	4.71	4.81	86,000
Southbridge,	3.86	2.02	48	.53	.1191	78	6.98	5.30	–
Spencer,	2.93	.16	95	.64	.0214	97	4.10	3.15	–
Stockbridge,	1.34	.25	81	.29	.0387	87	2.28	1.98	–
Westborough,	2.16	.97	55	.71	.0892	87	5.21	4.57	91,000
WORCESTER,	2.59	1.87	28	1.07	.2360	78	14.04	11.12	59,000

[1] See also Table No. 7.

TABLE NO. 7. — *Extent of Sewerage Works, Rate of Flow and Rate of Operation of Sand Filters, etc., 1920.*

CITY OR TOWN.	Population, Census of 1920.	Approximate Length of Sanitary Sewers (Miles).	Approximate Number of House Connections.	ESTIMATED QUANTITY OF SEWAGE TREATED (GALLONS PER DAY).			Estimated Average Quantity of Sewage per Connection (Gallons per Day).	Net Area of Filter Beds (Acres).	Estimated Rate of Operation with Even Distribution (Gallons per Acre per Day).
				Average for Year.	Average for Month of Maximum Flow.	Average for Month of Minimum Flow.			
Andover,	8,268	–	–	247,000	348,000	194,000	–	3.65[1]	68,000
ATTLEBORO,	19,731	30.86	1,152	586,000[2]	–	401,000	510	15.50	38,000
BROCKTON,	66,254	87.60	6,585	2,766,000[3]	–	–	420	37.00	55,000
Clinton,	12,979	21.56	1,590	1,095,000[2]	–	922,000	690	26.23	42,000
Concord,	6,461	8.90	476	532,000	724,000	402,000	1,120	4.28	124,000
Easthampton,	11,261	–	–	–	–	–	–	2.20	–
FITCHBURG,	41,029	–	–	3,004,000	–	–	–	–	–
Framingham,	17,033	26.45	2,323	1,263,000	2,114,000	853,000	540	21.12	60,000
Franklin,	6,497	16.00	534	210,000	–	–	390	3.24	65,000
Gardner,	16,971	28.18	1,831	1,000,000[2]	–	–	550	12.50	80,000
Hopedale,	2,777	–	–	87,000[2]	159,000	50,000	–	3.79	23,000
Hudson,	7,607	10.34	677	438,000[2]	632,000	298,000	650	9.00	49,000
Marion,	1,288	3.92	160	57,000[2]	–	–	360	.75	76,000
MARLBOROUGH,	15,028	29.82	2,175	1,079,000	1,819,000	633,000	500	20.90	52,000
Milford,	13,471	17.96	1,323	975,000	1,012,000	811,000	740	9.30	105,000
Natick,	10,907	–	1,406	1,497,000	3,918,000	478,000	1,060	12.60	119,000
North Attleborough,	9,238	16.60	646	777,000[2]	850,000	666,000	1,200	7.00	111,000
Northbridge,	10,174	–	–	582,000[2]	–	468,000	–	12.00	49,000
Norwood,	12,627	17.84	1,134	1,200,000	–	–	1,060	10.54	114,000
PITTSFIELD,	41,763	61.27	4,821	3,525,000[2]	–	3,095,000	730	41.15	86,000
Southbridge,	14,245	–	–	–	–	–	–	8.50	–
Spencer,	5,930	–	–	–	–	–	–	9.30	–
Westborough,	5,789	9.60	558	529,000	887,000	287,000	950	5.80	91,000
WORCESTER,	179,754	185.53[4]	–	4,290,000[5]	–	–	–	72.60	59,000

[1] Additional area under construction.
[2] Data for months of maximum flow not complete.
[3] Includes quantity treated by the trickling filter, amounting to about 725,000 gallons per day.
[4] Includes 69.81 miles of combined sewers.
[5] Amount treated by sand filters. Total flow 24,300,000 gallons per day.

Table No. 8. — *General Features.*

[For data concerning the trickling filters at Brockton and Fitchburg see Table No. 4.]

City or Town.	Year of Construction of and Additions to Works.	Depth of Underdrains (Feet).	Distance Apart of Underdrains (Feet).	Filtering Material.	Attention given to Disposal Works.
Andover,	1898	4	20	Fair sand, small quantity of gravel; practically all handled in construction.	One man all the time.
Attleboro,	1912, 1913	4–7	35	Excellent sand and gravel; found in place,	One man all the time; others when necessary.
Brockton,	1893, 1905, 1908, 1912	5.5	30	Good sand and gravel; found in place,	Four men all the time; large force when necessary.
Clinton,	1898, 1899	8	60–70	Good sand and gravel; found in place,	Two men all the time; others when necessary.
Concord,	1899	none	–	Good sand underlaid with gravel; found in place,	One man once a day.
Easthampton,	1908	3.5	20–40	Good sand and gravel; largely found in place,	One man all the time; one other when necessary.
Framingham,	1890	4–4.5	30–40	Good sand and gravel,	Three or more men in summer; only one in winter.
Franklin,	1915	4.5	26	Good sand and gravel,	One man every two or three days; others when necessary.
Gardner (Gardner area),	1891	5	20	Good sand; handled in construction,	One man all the time; others when necessary.
Gardner (Templeton area),	1901, 1909	3–4	20–30	Coarse sand; handled in construction,	One man all the time; more when necessary.
Hopedale,	1900	3	35–60	Some good sand and some rather fine sand,	One man all the time.
Hudson,	1904, 1910	5–6	50–100	Good sand and gravel; found in place,	One man all the time; others when necessary.
Leicester,	1894	4	8	Hard, compact sand; found in place,	Very little attention.
Marion,	1906	5	–	Mostly good sand; pockets of fine sand and some ledge; largely found in place.	One man every day in summer; every other day in winter.
Marlborough,	1891, 1908, 1909,1910,1911	4.5–6	30–50	Rather fine sand; found in place,	One man all the time; others when necessary.
Milford,	1907	5	40	Rather fine sand; found in place,	One man every day; others when necessary.
Natick,	1896	6	36	Sand of good quality, but strata of very fine sand in places; found in place.	One man all the time; others when necessary.
North Attleborough,	1909, 1910	5–6.5	55	Coarse sand and gravel; largely found in place,	One man every day; others when necessary.
Northbridge,	1906, 1907	4	50–75	Coarse sand and gravel; mostly handled,	One man all the time; others when necessary.
Norwood,	1909	4–6	40	Good sand and gravel; found in place,	One man every day; others when necessary.
Pittsfield,	1901, 1915	4	35	Good sand; mostly found in place,	Two men all the time; others when necessary.
Southbridge,	1908	4	40	Fair sand and gravel; considerable quantity handled, some found in place.	One man once a day.
Spencer,	1897	–[1]	–	Good sand and gravel; largely found in place,	One man all the time; others when necessary.
Stockbridge,	1899	3–4.5 3–4.5	23 30	Sand filters, good quality sand, Irrigation area, rather fine sand,	One man all the time.
Westborough,	1892, 1911	5	30–40	Good sand and gravel; handled in construction,	One man all the time; others when necessary.
Worcester,	1898[2]	4–6	35–50	Good sand and gravel; largely found in place,	Several men all the time; a large force when necessary.

[1] Only three beds underdrained.

[2] Year of first construction of sand filters. Many additions.

Examination of Rivers.

The condition of the polluted rivers of the State has been less objectionable than for many years. This has been due to two causes: (1) the excessive rainfall and flow of streams throughout the year; and (2) a great reduction in the polluting matter discharged from factories and mills, many of which have been closed or operated only on part time during the latter part of the year.

Assabet River.

The Assabet River in the upper part of its course has been in rather better condition than usual, but below Hudson the quantity of organic matter in the river water, notwithstanding the high flow of the river, was greater than usual. Below Maynard the river was offensive during the latter part of the summer, but, on the whole, not as objectionable as usual.

Blackstone River.

The Blackstone River below Cherry Valley has shown less pollution than at any time in the last four years, but at the outlet of Curtis Pond the pollution was slightly greater than last year, and this is true, also, of the stream above the Worcester sewage disposal works. Below the disposal works the condition of the river appears to have been much the same as last year. At Uxbridge and Millville its condition has shown little change in the last few years.

Charles River.

The condition of the Charles River has shown marked improvement throughout its course as compared with last year, a result due very largely to the reduced quantity of polluting matter discharged into the stream from factories and mills, since this river receives comparatively little sewage. Many of the factories in the upper part of the drainage area were either closed or operated only on part time during the latter half of the year. One of the largest mills in the lower portion of the watershed reduced its output for the year to about one-eighth of that of 1919. Under such conditions the effect of the discharge of manufacturing waste into the stream naturally has been much less noticeable than formerly.

Chicopee River.

The condition of the Chicopee River and its tributaries has been better than for many years. The flow of the river has been unusually great, and its pollution by manufacturing waste less than usual.

Concord and Sudbury Rivers.

The Sudbury River has been in better condition than usual, and the same is true of the Concord River, as far as the city of Lowell. Its condition in the city of Lowell continues to be objectionable, and no action appears to have been taken by the city or other parties interested as advised by the Department at various times, notably in a communication to the municipal council of Dec. 10, 1912.

Connecticut River.

The Connecticut River and its tributaries show little change as compared with previous years. While this river receives large quantities of polluting matter from the cities and towns along its course, its flow is so great in proportion to the population that practically no evidence of this pollution is noticeable, except by chemical analysis. Local pollutions along the banks, due to the discharge of sewage or other refuse too close to shore, have been objectionable at certain points for many years, and some of the tributaries, notably the Mill River below Northampton and the Manhan below Easthampton, are very badly polluted and objectionable in years of less than average rainfall.

Deerfield River.

The Deerfield River receives but little pollution at any point excepting near its mouth, where the sewage of the town of Greenfield enters the stream. Its condition has not been objectionable during the past year.

French River.

The French River, which is badly polluted at several points, especially by sewage and manufacturing waste at Webster, was less offensive than usual during the year.

Hoosick River.

There has been a marked increase in the pollution of the Hoosick River below Adams, but below North Adams and at Williamstown its condition was somewhat less objectionable than usual.

Housatonic River.

The Housatonic River has been polluted during the year by the discharge of untreated sewage from the city of Pittsfield, but the effect of this pollution has been diminished by the unusually high flow of the river.

Merrimack River.

The Merrimack River, like most of the other streams, has shown less evidence of pollution during the past year than usual. The reduction in the quantity of manufacturing waste discharged into the river at Lawrence had a marked effect in reducing the pollution of the river at that point during the latter part of the year.

Millers River.

The Millers River watershed contains few large towns, and the stream has never been very seriously polluted by sewage. It receives the sewage of the towns of Athol and Orange and small amounts of sewage at other points.

Nashua River.

The Nashua River below Fitchburg, but above the outlet of the city sewage disposal works, has shown more evidence of pollution than in any year for several years. At North Leominster its condition has been much the same as usual. The condition of Monoosnock Brook, a tributary which receives the sewage of Leominster, was worse than in the previous year, and the same is true of the main stream below Monoosnock Brook. In this portion of its course the stream was very offensive during the drier part of the year. Farther down the river the unusual dilution reduced considerably the effect of this pollution, and the condition of the river, on the whole, was about the same as in the previous year.

Neponset River.

The results of chemical analyses of the water of the Neponset River and its tributaries at a number of points show that the river has been less polluted than usual during the past year, a condition due no doubt to a reduction in manufacturing activity in this watershed. Additional disposal works for the treatment of manufacturing wastes have been built in this valley during the past year, which have no doubt contributed to the improvement in the condition of the river. One of these works treats the waste of a tannery in Walpole and another the wastes from a finishing works at Canton.

North River in Peabody and Salem.

The North River, one of the most polluted rivers in the State, has shown no improvement during the past year. Much of the sewage of Peabody has overflowed into the river, and the stream has been very offensive during the past year. Certain minor changes have been made at the Salem pumping station, but the main improvements needed to insure efficient operation of the trunk sewer and outfall works have been postponed, in common with other necessary public works.

Taunton River.

The Taunton River below Brockton has been more noticeably polluted than usual, notwithstanding the high flow of the river. The condition of the river has been less objectionable than usual in other parts of its course, due to its unusual flow.

Other Rivers.

The remaining rivers of the State are less affected by pollution than those mentioned, and no change in their condition worthy of note has occurred during the past year.

Division of Water and Sewage Laboratories

H. W. Clark, *Director*

Report of Division of Water and Sewage Laboratories.

The activities of this Division are divided between analytical work and research. During the year 1920, in the State House laboratories of this Division and at the Lawrence Experiment Station, 13,413 chemical, microscopical and bacterial analyses were made, as shown by the following summary. A large percentage of these analyses was made to ascertain the condition during the year of public water supplies, ice supplies, rivers and domestic wells, the efficiency of municipal water filters and the safety of their effluents for domestic use, the quality of the sewage applied to and of the effluents from sewage filters, the character of trade wastes for the furtherance of studies regarding their disposal, and the condition, as regards bacterial pollution, of shellfish from different sources, etc. Besides this a large amount of analytical work was done for the new Commission upon Water Supply Needs and Resources of the State.

Most of the analyses made in the State House laboratories are summarized in the tables presented in the annual reports of the Division of Sanitary Engineering.

Research was carried on during the year in regard to the corrosion of pipes in many cities and towns of the State, and at the experiment station many studies were made upon methods for the disposal of trade wastes; upon important modifications of the activated sludge tank process of sewage disposal; upon seasonal and other variations in the bacterial quality of shellfish from different areas of the State; of the relative significance of B. coli and B. aërogenes in bacterial water examinations and methods for the differentiation of these two bacteria; in regard to the efficiency in water treatment of liquid chlorine at low temperatures; of the effect of certain wastes upon municipal filtration areas, etc. Many experimental water and sewage filters, septic tanks, etc., are in operation at the station for various purposes.

One of the interesting and exceedingly important and promising lines of research carried on at the station during the past three years has been in regard to the removal of color from water by the precipitation of the usual color removing chemicals in the sand of filters

instead of by the direct application of such chemicals to the water undergoing filtration, as is universal in the so-called mechanical filtration of water. By this method of color removal the chemicals are used over and over again, thus reducing the cost of such water treatment very materially. In fact, the longer such filters continue in operation the smaller grows the cost per million gallons of water treated, owing to the continual re-use of the chemicals. Among other advantages of the method is the absence of carbonic acid in the filter effluents, thus lessening the danger of corrosion common with mechanical filter effluents and the absolute prevention of acid effluents due to the passage through the filters of undecomposed aluminum sulphate.

The analytical work can be classified as follows: —

State House Laboratories.

Samples from public water supplies: —	
Surface waters,	2,440
Ground waters,	1,030
Samples from rivers,	768
Samples from sewage disposal works: —	
Sewages,	380
Filter effluents,	570
Samples of wastes and effluents from factories,	173
Samples of sea water from various locations,	22
Miscellaneous samples (color, hardness, chlorine, etc.),	212
	5,595
Special examinations of water for manganese, lead, etc.,	556
Determinations of fats, alkalinity, etc.,	406
Microscopical examinations,	1,983
Determinations of dissolved oxygen, carbonic acid, etc. (field work),	240
	3,185

Lawrence Experiment Station.

Chemical examinations on account of investigations concerning the disposal of domestic sewage and factory wastes, filtration and other treatment of water supplies and swimming pools,	1,072
Mechanical and chemical examinations of sand,	56
Bacterial examinations of water from public water supplies, rivers, sewage effluents, ice, etc.,	807
Bacterial examinations in connection with methods of purification of sewage and water,	2,358
Bacterial examinations of shellfish,	342
	4,635

Investigations in Regard to Corrosion of Pipes.

In the condensed reports of the work of this Division as now written, it is impossible to describe very fully all the investigations made, but the following pages give information in regard to some of them.

Owing to the occurrence twenty-five years ago of many cases of lead poisoning in the State, an investigation was then made in regard to the cause of this poisoning and the corrosion of service pipes. At that time a large amount of research work was done and the results of all that work were incorporated in two articles concerning the action of water upon metals, — one published in the report for 1898 and the other in the report of this Department for the year 1900.[1] The summary of this latter article was as follows: —

> The results of the investigation up to the time of writing the report given in 1898 seemed to show that the cause of the taking of lead from the service pipes by the water of certain towns and cities was the presence of a considerable volume of free carbonic acid in the ground waters, which actively attacked lead, and further investigation has confirmed this conclusion. . . . While pure soft water, especially when containing some dissolved oxygen, attacks lead, and while the presence of coloring matter, free ammonia, nitrates and nitrites in soft water also causes considerable solvent action, . . . yet, taking into consideration the results of our entire investigation we find that in actual practice, with the conditions prevailing in the service pipes of a distribution system, a potable water in Massachusetts to have any dangerous lead-dissolving action must contain considerable free carbonic acid.

It was shown, also, that the greater the hardness of a water, as compared with its free carbonic acid, the less effect did this carbonic acid have upon lead. At that time much work was done, as described in these two articles, in regard to the action of waters upon tin, zinc, brass, etc., as well as lead.

In modern chemistry the reason that some waters corrode metals while others do not is explained by stating that the two essential factors in corrosion are the hydrogen ion and dissolved oxygen. The hydrogen ion is the active principle of acidity and this is the present way of stating that the more acid a water is the more corrosive it is. The old statement holds true, however, that the greater the acidity shown by the carbonic acid present and the purer the water, that is, the freer from mineral and other matters, the more corrosive is its action upon metals.

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[1] Action of Water upon Metallic or Metal-lined Pipes, etc., by H. W. Clark and Fred B. Forbes, pages 487 to 506, inclusive, Report of State Board of Health for 1900.

Early in 1920 further investigations were begun upon this subject of corrosion, due to troubles experienced in some of the cities and towns of the State by the destruction, apparently by water, of certain parts of iron, copper and brass piping, this trouble occurring invariably in cities and towns having ground water supplies.

In the course of this investigation twenty-three municipalities have been visited and many determinations of alkalinity, free and half-bound carbonic acid and dissolved oxygen have been made, these determinations being made on the supplies at the source, and also considerable work has been done to determine the quality in these three particulars of private wells adjacent to the public supplies.

As a result of this work, it has been found, as was determined more than twenty years ago, that the active factor in corrosion is the acidity of the water, and this acidity is best ascertained by the determination of the carbonic acid present. Ground water supplies containing free carbonic acid in amounts greater than 1.70 parts in 100,000 have, according to this new investigation, caused corrosion, while those containing carbonic acid in quantities less than this do not apparently cause trouble with brass, copper and iron pipes.

The following table shows cities and towns where corrosion occurs, together with the amount of carbonic acid present in parts in 100,000, and cities and towns where examinations have been made and found to be comparatively free from corrosion, together with the carbonic acid figures of the water supplies in these municipalities.

List of Cities and Towns having and not having Corrosion Trouble.

City or Town having Corrosion.	Carbonic Acid (Parts in 100,000).	City or Town not having Corrosion.	Carbonic Acid (Parts in 100,000).
Ayer,	3.78	Medway,	1.69
Lowell,	3.67	Hopkinton,	1.63
Billerica,	3.52	Needham,	1.58
Brookline,	3.26	Dracut,	1.28
Dedham,	2.90	Chelmsford,	1.14
Weston,	2.86	Littleton,	1.06
Acton,	2.51	Walpole,	1.01
Waltham,	2.46	Natick,	1.01
Wellesley,	2.20	Bedford,	.84
Tewksbury,	2.06	Groton,	.70
Newton,	2.02	Westford,	.44
Norwood,	1.80		

In the course of this work it has been found that the presence of cemeteries upon the watersheds apparently had a direct effect upon the amount of carbonic acid present in the water supplies. For instance, in one of the cities of the State using ground water entirely and having a large area covered with driven wells, it was found that

while carbonic acid was comparatively high in the water of all these wells, the higher amounts found were from the side of the driven well field on the edge of the watershed bordered by a continuous line of cemeteries laid out on sandy soil and extending for about half a mile in a line parallel with the well field.

Bacillus Coli and Bacillus Aërogenes.

B. coli has long been used as an index of the bacterial pollution of water, but by the usual methods of determination the results recorded include two general groups, — B. coli proper, which gives a positive methyl red test and negative Voges-Proskauer test, and B. aërogenes, which gives a negative methyl red and a positive Voges-Proskauer test. The aërogenes group so differentiated is further divided by liquefaction or non-liquefaction of the gelatin into B. cloacæ and B. aërogenes proper. The standard methods of bacterial analysis in general use in water laboratories further differentiate B. aërogenes as to its origin, whether fecal or non-fecal, by its ability to ferment adonite. As bacterial work along this line continued, the belief grew that aërogenes was not necessarily of fecal origin and that its presence in water did not have the same significance as did B. coli proper, consequently much work has been done by various investigators on the coli-aërogenes group.

In studying this problem in the laboratories of this Division during the present year 1,560 coli-like cultures from many sources have been isolated and differentiated into B. coli, B. aërogenes and B. cloacæ. The cultures isolated were from human and animal fæces, sewage and the effluents from sewage and water filters, ground water, surface water and sea water, ice, soils, grains and shellfish, and a following table summarizes the results of this work.

The notable things shown in the table are that 98 per cent of the coli-like cultures isolated from human fæces proved to be coli proper and only 2 per cent aërogenes, and of the colonies isolated from the animal fæces, 96 per cent were coli proper and 4 per cent aërogenes; on the other hand, 20 per cent of the cultures isolated from sewage proved to be aërogenes and 3 per cent cloacæ; and from rivers, filtered water, ground water and surface water, 33, 34, 40 and 42 per cent, respectively, of the isolated cultures were aërogenes.

From this work and from the work of others it appears that aërogenes is not common in fæces and that there is evidence that they are normal inhabitants of the soil or at least the surface of the ground, and their presence in water is due to this fact. The only feature of this belief not entirely satisfactory is that one would expect to find

them, if this is true, in comparatively large numbers in surface waters. Such is not the case, however, especially with unpolluted waters. Another hypothesis is that aërogenes found in water is a degenerate or modified form of coli, that is, one that can uniformly lose certain properties of coli proper when existing for a considerable period under adverse conditions.

Various experiments were made during the year in the laboratory to transform coli to aërogenes by subjecting them to different conditions of growth. So far this attempt has not been successful although great modification of the coli cultures has been accomplished. In further work along this line as many coli-like cultures as possible have been isolated from samples of well and spring waters examined in our routine work. These coli-like cultures have been further differentiated into coli proper and aërogenes and the results compared with the surroundings of the wells examined and the chemical analysis of these waters.

While not enough work has been done as yet on this particular question to give conclusive data, it can be said that the majority of samples of B. coli proper came from wells with poor surroundings or which showed pollution by the chemical analysis, while aërogenes were found generally in well waters good chemically and with satisfactory surroundings.

Source.	Number of Cultures isolated.				Per Cent of Cultures isolated.		
	B. Coli.	B. Aërogenes.	B. Cloacæ.	Total.	B. Coli.	B. Aërogenes.	B. Cloacæ.
Human fæces,	57	1	-[1]	58	98	2	-[1]
Animal fæces,	26	1	-[1]	27	96	4	-[1]
Sewage,	50	14	2	64	77	20	3
Effluents from sewage filters,	87	28	21	136	64	21	15
Soils,	-	7	-	7	-	100	-
Grains,	6	26	-[1]	32	19	81	-[1]
Bath water,	18	14	16	48	39	28	33
Ice,	21	7	-[1]	28	75	25	-[1]
Rivers,	68	34	-[1]	102	67	33	-[1]
Filtered river waters,	62	34	4	100	62	34	4
Ground waters,	109	126	92	327	33	40	27
Surface waters,	18	26	17	61	30	42	28
Shellfish,	141	69	52	262	54	26	20
Sea water,	54	25	57	136	40	18	42
Miscellaneous,	113	2	33	148	-	-	-

[1] No differentiation made between B. aërogenes and B. cloacæ.

Studies of Shellfish.

During the past two years a very extensive investigation has been made by this Division in regard to the determination of the suitability for consumption of clams from different sources based upon the bacterial contents of their shell water. When the pollution of clam flats is evident by inspection, bacterial examinations are probably more or less unnecessary, but many cases are brought to the attention of the Department yearly where inspection of the areas does not give positive information.

For purposes of this study three areas were selected, namely, (1) Newburyport, (2) Ipswich River and (3) Treadwell Island Creek. The Joppa flats at Newburyport were selected as typical of a badly polluted area. These flats are extensive and on their upper portion the main sewer of the city of Newburyport empties. Besides this they are polluted by the Merrimack River water which receives all the sewage of the cities and towns along its course and which empties into the sea at Newburyport.

The Ipswich River flat was selected as one of probably slight pollution but one from which clams might be used. The flats from which the clams were taken are about 500 feet below the town boat landing at Ipswich and the river is moderately polluted, although the town, with a population of 6,201, is unsewered.

The flats at Treadwell Island Creek are as free from pollution as could be found on the shore of the northerly part of Massachusetts. Owing to the large area of the Newburyport flats, clams were collected invariably from five stations, the nearest station to the sewer outlet being 3,000 feet below this outlet and near low-water mark; Station No. 2 was in shore at right angles to the river and 935 feet from Station No. 1; Station No. 3 was 4,375 feet below the sewer outlet near low-water mark; Station No. 4 was 1,025 feet in shore from Station No. 3, and Station No. 5 was 5,800 feet from the sewer outlet.

The average B. coli score of a series of samples of clams collected from each of these stations during this period of study is given in a following table and includes samples collected each month through two seasons. The volume of sewage reaching the Newburyport flats is fairly constant and the only things influencing the amount of pollution reaching the various stations from which clams were collected were the tide and the height of the river.

The following table gives the B. coli score and the maximum and minimum scores obtained at each area: —

Numerical Value of B. Coli in the Shell Water of Clams by the Scoring Method.

Place of Collection.	Average.	Maximum.	Minimum.
Newburyport: —			
Station No. 1,	3,000	23,000	30
Station No. 2,	910	4,100	23
Station No. 3,	1,100	5,000	4
Station No. 4,	340	2,300	4
Station No. 5,	570	4,000	3
Ipswich River,	230	500	4
Treadwell Island Creek,	7	32	0

It will be seen that while the average B. coli score of the Newburyport clams was high and the maximum very high, yet at times samples were collected from every station having a very low score, clams at these times being in a bacterial condition which would have allowed them to have passed the American Public Health standard. Such results might be very misleading if only one or two sets of samples had been taken. The average maximum and minimum score of the clams from the Ipswich River flats show that these clams were only slightly polluted compared with the Newburyport clams, while the results of many series of samples taken at Treadwell Island Creek show the clams from this source to be practically free from pollution, the average score being but 7, the maximum 32 and the minimum 0. There appeared from our examinations to be no regular seasonal variation in the B. coli scores as has been stated by various workers.

A second table is given showing the average number of bacteria in the shell water of the clams at different stations, and also in the sea water covering the flats at different times.

Number of Bacteria per Cubic Centimeter in Shell Water and Sea or River Water.

Place of Collection.	Average.			Maximum.			Minimum.		
	20° C.	37° C.		20° C.	37° C.		20° C.	37° C.	
		Total.	Red.		Total.	Red.		Total.	Red.
Newburyport: —									
Shell water of clams: —									
Station No. 1,	32,300	4,100	2,700	150,000	21,000	17,500	1,000	420	270
Station No. 2,	26,000	5,800	3,700	60,000	30,000	25,000	800	75	60
Station No. 3,	21,500	2,700	2,400	75,000	23,000	20,000	600	30	10
Station No. 4,	16,200	1,100	470	57,000	6,000	2,000	800	38	20
Station No. 5,	24,000	2,200	430	81,500	19,000	2,500	900	70	0
Sea water: —									
Station No. 1,	37,300	4,000	920	100,000	22,000	5,000	2,500	70	18
Station No. 3,	2,600	45	14	4,800	80	20	1,100	11	1
Station No. 5,	7,900	100	20	25,000	330	90	600	6	0
Ipswich River: —									
Shell water of clams,	7,000	2,170	760	16,000	6,600	3,300	1,000	60	40
River water,	9,900	3,600	650	25,000	19,500	2,300	1,300	43	9
Treadwell Island Creek: —									
Shell water of clams,	5,100	520	81	21,000	2,500	700	700	60	0
Sea water,	1,100	48	4	2,800	240	25	160	3	0

Purification of a Gas Company's Wastes.

During the year an interesting experiment was made in regard to the purification of wastes from the plant of a gas company by filtration through a deep filter of shavings at a rate of 1,000,000 gallons per day, — the process and rate proposed by this company. The wastes as received were very turbid brown liquors containing a large amount of matters in suspension and 111 parts tar in 100,000. By filtration through the filter of shavings the tar was reduced in amount to 27 parts and the matters in suspension from 131 to 40 parts. The effluent, however, was still an exceedingly polluted, foul-looking liquid, and the filter of course became very rapidly clogged. Treatment of the waste as received with lime at the rate of 10,000 pounds per 1,000,000 gallons of waste effected a good precipitation, producing a clear, straw-colored liquor, having only .2 parts tar in 100,000. These results were similar to those obtained through previous years when investigating wastes of this kind. The volume of waste which it was proposed to treat varied from 5,000 to 10,000 gallons a day.

B. Coli in the Water of Swimming Pools.

In the study of swimming pools used by a large number of bathers it has seemed more or less surprising that more B. coli were not found in the water examined, and during the year a special study was made in regard to the coli pollution of water per bather per given volume of water used. It was found by this study that when an average cleanly person bathed in a certain measured volume of water, having a temperature of not over 98° F., this water would, when soap was not used, contain 4 B. coli per cubic centimeter, and the number was, with the use of soap, increased to 7 per cubic centimeter. Bacterial determinations by the four-day count averaged 857,000 and 1,610,000 per cubic centimeter under the conditions mentioned, that is, with or without the use of soap in bathing. Applying these results to swimming pools, the following facts can be deduced, namely, if 100 bathers per day use, without previous shower baths, a swimming pool of 60,000 gallons' capacity and full of clean water, the water on examination should show approximately 11,000 bacteria per cubic centimeter determined by the four-day counts and one colon bacillus in 20 cubic centimeters in addition to the number primarily present before use. These figures are, of course, approximate only, but are of considerable interest taken in connection with the bacterial results obtained in swimming pool examinations.

Operation of Trickling Filters.

During the year ten trickling filters receiving sewage clarified by sedimentation have been in operation at the station. One of these, No. 135, has now been in operation for twenty-one years and is probably the oldest trickling filter in America, and hence is of particular interest in giving data upon the permanence of such filters and the care or expense necessary to keep them in operation year after year. This filter is constructed 10 feet in depth of fine broken stone, all of which passes a 1-inch screen but is retained by a $\frac{1}{4}$-inch screen. During the twenty-one years of operation it has been necessary to dig over the surface of the filter to a depth of from 3 to 8 inches only eight times. Besides this the upper 18 inches of stone was removed, washed and replaced in April, 1918.

The eight filters used in studies of the economy and efficiency of different depths have been continued in operation. Four of these, Nos. 452 to 455, inclusive, were started in 1913, and four, Nos. 472 to 475, inclusive, in 1915. The first series, 4, 6, 8 and 10 feet in depth, respectively, is constructed of broken stone, all of which passes a $1\frac{1}{2}$-inch screen and is retained by a $\frac{3}{4}$-inch screen. The second series, Nos. 472 to 475, inclusive, while of the same depth, that is, 4, 6, 8 and 10 feet, is constructed of broken stone of a larger grade, the average volume of pieces ranging from 25.2 to 29.4 cubic centimeters. With this coarser material each filter has only about one-half as much filtering surface per foot in depth of filter as given by the finer material in Filters Nos. 452 to 455, inclusive.

A following table gives the average rate of operation for each of these filters per foot of filter depth, and the per cent of samples of effluent which were stable. It has been intended to operate the first series of filters at the same rate per foot of depth, or approximately 170,000 gallons per foot a day per acre. Various experiments made with the second series of filters, namely, Nos. 472 to 475, inclusive, have prevented comparative studies of efficiency and economy of deep and shallow filters, except Nos. 472 and 474, 4 and 8 feet in depth, respectively.

Filter No. 474 has been operated at an average rate of 2,050,000 gallons per acre daily, while Filter No. 472 has been operated at a rate of 578,000 gallons per acre daily, or, expressed in foot per depth per day, 256,600 and 144,000 gallons, respectively; that is, the deep filter has been operated at a rate of 112,000 gallons greater per foot, this giving a rate per acre three and one-half times as great as the shallow filter. Notwithstanding this, it has produced an effluent of practically the same character as that obtained from Filter No. 472.

The two following tables give the results of operation of these filters during the year: —

Average Rates and Results. — Trickling Filters.

Filter Number.	Depth (Feet).	Gallons filtered per Acre daily per Foot of Filter Depth during 1920.	Per Cent of Samples Stable during 1920.
452,	4	171,500	85
453,	6	161,200	90
454,	8	169,600	95
455,	10	175,100	100
472,	4	144,000	65
473,	6	516,500	5
474,	8	256,600	60
475,	10	177,900	80

Average Analyses.

Effluents from Trickling Filters Nos. 135, 452, 453, 454, 455, 472, 473, 474, 475 and 502.

[Parts in 100,000.]

Filter Number.	Quantity applied. — Gallons per Acre Daily.	Ammonia.			Kjeldahl Nitrogen.	Chlorine.	Nitrogen as —		Oxygen consumed.	Bacteria per Cubic Centimeter.
		Free.	Albuminoid.							
			Total.	In Solution.			Nitrates.	Nitrites.		
135,	1,337,000	3.50	.55	.32	.99	7.8	1.79	.0180	3.63	854,000
452,	686,000	3.71	.73	.44	1.33	8.0	1.26	.0237	4.03	1,323,000
453,	967,000	3.21	.58	.34	1.04	7.9	2.10	.0256	3.24	637,000
454,	1,357,000	3.00	.58	.32	.99	7.8	1.83	.0298	3.43	532,000
455,	1,751,000	2.77	.52	.28	1.00	7.7	2.05	.0313	3.38	553,000
472,	578,000	3.62	.64	.38	1.18	7.8	.92	.0282	3.84	812,000
473,	3,099,000	4.07	.88	.45	1.65	7.8	.63	.0655	4.81	1,733,000
474,	2,050,000	3.68	.66	.37	1.17	7.7	.94	.0367	3.64	1,943,000
475,	1,779,000	3.32	.63	.36	1.15	7.7	1.76	.0330	3.80	1,332,000
502,	3,396,000	2.95	.38	.25	.68	7.9	1.64	.0436	1.95	2,204,000

During the year careful records have been made of the solids in suspension in the effluents from all the trickling filters at the station, this being along the line of studies of recovery of valuable fertilizing

material just as so many studies are being made at the present time in regard to the retention and utilization of sludge from the activated sludge tank process of purification.

The following table presents the results of this work in pounds per 1,000,000 gallons of suspended matter in these effluents. During the year, moreover, as during previous years, an experiment was made in regard to settling these solids and it was found that two hours' sedimentation was sufficient to settle out about 90 per cent of the suspended matters. This settled effluent was applied to trickling Filter No. 502, 6 feet in depth and operated at a rate of 6,000,000 gallons per acre daily. The results of operation of this filter, as shown by analytical work, are given in the tables.

Average Suspended Solids in Trickling Filter Effluents, etc.

Effluent from Filters.	Suspended Solids (Pounds per Million Gallons).
No. 135,	1,291
No. 452,	1,642
No. 453,	1,249
No. 454,	1,424
No. 455,	940
No. 472,	1,441
No. 473,	2,275
No. 474,	1,708
No. 475,	1,615
No. 502,[1]	589
Settled sewage applied to trickling filters,	1,524

[1] Receives settled effluent from Filter No. 473.

Average Solids.

Effluents from Trickling Filters Nos. 135, 452, 453, 454, 455, 472, 473, 474, 475 and 502.

[Parts in 100,000.]

Filter Number.	Unfiltered.			Filtered.			In Suspension.		
	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
135,	61.3	24.4	36.9	45.7	17.1	28.6	15.6	7.3	8.3
452,	66.3	30.1	36.2	46.6	17.3	29.3	19.7	12.8	6.9
453,	62.5	26.4	36.1	47.5	18.3	29.2	15.0	8.1	6.9
454,	63.8	26.8	37.0	46.7	18.7	28.0	17.1	8.1	9.0
455,	58.2	28.5	29.7	46.9	20.4	26.5	11.3	8.1	3.2
472,	60.7	25.0	35.7	43.4	17.3	26.1	17.3	7.7	9.6
473,	72.4	28.9	43.5	45.1	17.0	28.1	27.3	11.9	15.4
474,	67.9	26.1	41.8	47.4	19.1	28.3	20.5	7.0	13.5
475,	67.4	27.4	40.0	48.0	17.0	31.0	19.4	10.4	9.0
502,	48.1	16.6	31.5	41.0	13.8	27.2	7.1	2.8	4.3

Intermittent Sand Filters in Operation Thirty-three Years.

Filters Nos. 1, 4 and 9A.

At the end of 1920 Filters Nos. 1 and 4 had been in operation for nearly thirty-three years and Filter No. 9A for thirty years. Each filter is 1/200 of an acre in area and approximately 5 feet in depth. During practically all this period regular station sewage without preliminary clarification has been applied to them. For many years, moreover, it has been the custom to apply only as much sewage to each filter as can be received by them without materially increasing the amount of stored organic matter.

The following table shows the construction, period of operation, etc., of each filter.

Filter Number.	Depth (Feet).	Effective Size of Sand (Millimeter).	Date first operated.	Actual Volume of Sewage applied since Start (Gallons).	Volume of Sewage applied daily during 1920 (Gallons per Acre).
No. 1, ...	5	.48	Dec. 10, 1888	3,150,100	35,200
No. 4, ...	5	.04	Dec. 19, 1887	1,113,000	18,600
No. 9A, ...	5	.17	Nov. 18, 1890	2,636,200	33,700

These are undoubtedly the oldest sand filters in point of operation in the country, and it is notable that each has been operated without sand removal since 1893, — a period of twenty-seven years. There has been, however, a gradual increase in the amount of stored organic matter in the upper foot of each filter as shown by yearly examinations, although the amount fluctuates from time to time. During the past few years this stored matter has increased more rapidly than usual owing to the increasing strength of the sewage applied, and because of this the rate of application of sewage to Filters Nos. 1 and 9A was reduced on January 23 from 50,000 to 40,000 gallons daily.

The effluents from these filters are practically always slightly acid, this being partly due to lack of sufficient base in the sewage to combine with the nitric acid formed during the process of purification. As it is possible that this acid condition may interfere with the best working condition of these filters, an experiment was made on October 9 whereby 100 pounds of hydrated land lime were scattered over the surface of Filter No. 9A. The application of this lime, however, has not been effective so far in changing the character of the effluent. At the end of the year it was decided to remove temporarily the upper

foot of sand loaded with organic matter from Filter No. 9A, and on November 26 this was done. This removal of 12 inches in depth is equal to less than one-half inch per year of operation since the last removal. Moreover, this removal was not at all necessary, but, as stated, was simply to ascertain certain facts. At one of the municipal sewage areas of the state much washing of dirty sand, at an expense of $1.75 per cubic yard, has been done during recent years, and it is probable that the removed sand in this instance will be washed before replacement. The surfaces of Filters Nos. 1 and 9A are always trenched and ridged late in the fall and leveled in the spring. During the winter these trenches are covered with boards to imitate as nearly as possible the ice coverings formed in cold weather over the municipal filtration areas. Analyses of sands and effluents are shown in the following tables: —

Sand Analyses.

Albuminoid Ammonia in First Foot of Sand in Filters Nos. 1 and 9A.

[Parts in 100,000.]

Year.	Filter No. 1.	Filter No. 9A.
1910,	66.1	56.5
1915,	74.9	81.1
1918,	106.0	86.3
1919,	91.4	68.0
1920,	112.2	92.3

Average Analyses.

Effluent from Filter No. 1.

[Parts in 100,000.]

Temperature (Degrees F.).		Ammonia.		Chlorine.	Nitrogen as —		Oxygen consumed.	Alkalinity.	Bacteria per Cubic Centimeter.
Applied.	Effluent.	Free.	Total Albuminoid.		Nitrates.	Nitrites.			
59	51	.7774	.0624	7.6	3.90	.0017	.56	—2.1	7,650
Effluent from Filter No. 4.									
59	53	.0885	.0230	7.2	2.82	.0017	.35	—3.2	1,020
Effluent from Filter No. 9A.									
59	53	.7067	.0598	7.6	2.87	.0014	.63	—2.1	9,655

Removal of Color from Water.

One of the most important investigations carried on at the experiment station during the past three years has been in regard to the removal of color from water by filtration through sand filters impregnated with aluminum or ferric hydroxide. In ordinary sand filtration it is seldom that more than from 30 to 40 per cent of the color of the applied water is removed, and, while all coloring matter can be removed by the ordinary mechanical filters, so called, there are, in certain parts of the country at least, some objections to the use of these filters. This is due to the application of chemicals to water undergoing filtration, the additional corrosive properties given to the water by such treatment, etc.

By the method of color removal previously described, namely, by sand filtration through filters impregnated with ferric or aluminum hydroxide, the corrosive properties of the water treated are not increased, little or no carbonic acid is present in their effluents, and the cost of operation is small when compared with mechanical filtration and the direct application of chemicals to the water undergoing treatment.

During the year three filters, each containing 4 feet in depth of sand with an effective size of 0.25 millimeter, were operated at a rate of 5,000,000 gallons per acre daily. The results, as a whole, have been better than obtained during previous years, and it is probable that with a greater precipitation of chemicals within the filters a much greater color removal can be obtained. Filter No. 488, put into operation in May, 1917, has had applied to it 58.5 tons per acre of ferric sulphate which has been precipitated throughout the body of the filter as ferric hydroxide; Filter No. 494, put into operation in January, 1918, has had applied to it 66.5 tons per acre of commercial aluminum sulphate precipitated within the filter as aluminum hydroxide; Filter No. 496, put into operation in September, 1918, has had applied to it 27 tons per acre of ferric sulphate precipitated within the filter as hydroxide. In the case of each filter practically the entire amount of chemical has been precipitated in the sand at the time of filter construction. Merrimack River water was applied to Filters Nos. 488 and 494 during the year, while Filter No. 496 received the effluents from these two filters. Trial was made of a fourth filter containing 4 feet in depth of pea-size coke and 135 tons per acre of ferric sulphate precipitated as hydroxide, but this filter was more or less of a failure, however.

Such filters when first put into operation remove practically all the

color of the water applied. Eventually, when the color removal falls to about 50 per cent, it is our custom to treat them with caustic soda at the rate of 5 or 10 tons an acre. Generally the volume of solution used has been equal to about one-fifth the water capacity of the sand of the filter and the solution has been passed through four or five times, this method apparently giving better renewal results than when the open space of the sand has been filled with a more dilute solution and this solution allowed to remain within the filter for a matter of twelve hours or more. After such treatment it requires about three days' operation of the filter to remove the excess soda applied. The volume of water used during this period as wash water is about 7.5 per cent the total volume of the amount filtered between such treatments. This treatment with caustic is very efficient in removing the organic coloring matter, the organic matter determined as albuminoid ammonia and that determined as oxygen consumed, which accumulates in the filter during each period of operation, the percentage removals of each averaging about 74, 45 and 50, respectively. The period between these necessary treatments has averaged forty-seven days in the case of Filter No. 488, forty-five days in the case of Filter No. 494 and one hundred and sixteen days in the case of Filter No. 496. The amount of chemicals per gallon of water filtered through each of these filters has been as follows: Filter No. 488, .15 grain of ferric sulphate and .50 grain of caustic soda; Filter No. 494, .34 grain and .55 grain, respectively; Filter No. 496, .12 grain and .23 grain, respectively. These amounts are exceedingly small compared with the amounts necessary when treating Merrimack River water by the usual mechanical filter methods. Comparing amounts and costs shows that by the new method the cost for chemicals up to the present time has been less than one-third of mechanical filter costs and the cost per 1,000,000 gallons treated by this method is continually growing less owing to the fact that the treatment with caustic renews the efficiency of the aluminum or ferric hydroxides in these filters and hence these chemicals are used over and over again. Owing to the treatment with caustic, moreover, little surface scraping is necessary, Filters Nos. 488 and 494 being scraped but once during 1920.

The increase in mineral matter in the effluents from these filters during the year has been .26, .24 and .69 parts in 100,000, respectively. The filters are not efficient in the removal of bacteria, this undoubtedly being due to the removal of the sticky organic matter on the sand grains by the caustic soda applied from time to time to remove the color and other organic matters accumulated within the filter.

Average analyses of the water applied to and of the effluent from these filters follow: —

Average Analyses.

Canal Water applied to Filters Nos. 488 and 494.

[Parts in 100,000.]

Color.	Ammonia.			Nitrogen as —		Oxygen consumed.	Iron.	Alkalinity.	Soap Hardness.
	Free.	Albuminoid.							
		Total.	In Solution.	Nitrates.	Nitrites.				
.40	.0175	.0181	.0133	.023	.0004	.62	.0570	1.0	1.1
Effluent from Filter No. 488.									
.13	.0091	.0076	–	.027	.0007	.25	.0229	1.3	1.3
Effluent from Filter No. 494.									
.15	.0093	.0087	–	.024	.0005	.25	.0220	1.3	1.3
Effluent from Filter No. 496.									
.07	.0046	.0050	–	.028	.0003	.14	.0136	1.3	1.3

The Effect of Low Temperatures upon Sterilization of Water by Means of Liquid Chlorine or Bleach.

It is becoming well recognized that liquid chlorine, or bleach, is less efficient in cold than in warm weather, and during the year certain laboratory experiments were made at the experiment station to study this difference. The few tests given in the following table are characteristic of results along this line. A solution of liquid chlorine of known strength was added to portions of Merrimack River water having temperatures of 78° F. and 46° F., samples being taken and platings made thirty minutes after treatment. Similar tests were made with bleach at temperatures of 69° F. and 41° F., the available chlorine being .4, .6 and .8 part per million. The results are shown here: —

Average Bacterial Analyses before and after Chlorination at Different Temperatures.

	Temperature (Degrees F.).	Bacteria per Cubic Centimeter.			B. Coli in 100 Cubic Centimeters.
		20° C.	37° C.		
			Total.	Red.	
Control,	78	4,660	270	36	6,C00
Liquid chlorine: —					
.4 part per million,	78	305	23	1	442
.6 part per million,	78	154	15	0	62
.8 part per million,	78	58	11	C	4
.4 part per million,	46	700	39	5	640
.6 part per million,	46	180	16	1	244
.8 part per million,	46	250	13	1	44
Control,	69	2,900	140	28	5,5C0
Chlorine from bleach: —					
.4 part per million,	69	2,500	15	2	550
.6 part per million,	69	490	11	1	100
.8 part per million,	69	330	5	0	55
.4 part per million,	41	790	19	3	550
.6 part per million,	41	1,640	12	3	550
.8 part per million,	41	640	13	1	100

Bacterial Measurement of the Degree of Pollution of Water.

In considering the pollution of surface waters as shown by bacterial examinations, it is often of interest to know what this pollution would be if expressed in added gallons of sewage per 1,000,000 gallons of water, and in considering this question many samples of Lawrence sewage examined for B. coli according to the standard methods showed an average of 60,000 coli per cubic centimeter or 227,000,000 per gallon. Hence, if B. coli are regularly found in 1 cubic centimeter of water tested, it indicates by bacterial measurement a pollution equivalent to approximately 17 gallons of such sewage as we have examined in 1,000,000 gallons of water otherwise unpolluted. These figures are, of course, only approximate and neither allow for unequal distribution or other modifying factors.

Division of Food and Drugs

Hermann C. Lythgoe, S.B., *Director*

Report of Division of Food and Drugs.

During the year 1920 the Food and Drug Division of the Massachusetts Department of Public Health has been engaged in the usual routine work relative to the enforcement of the milk, food, drug, cold storage, slaughtering and bakery laws, and in the examination of samples submitted by the police authorities and by the Department of Public Welfare, and also in the manufacture of arsphenamine.

There have been a few changes in the scientific portion of the personnel. Two of the chemists, Mr. Williams and Mr. Wells, left the Department to accept positions offering greater remuneration. They were replaced by the transfer of Mr. John J. May from the Division of Standards, Department of Labor, and by the employment of Mr. Harry J. Fisher. There were no changes in the personnel of the inspectors nor of the clerical force, except that one additional clerk was employed on account of additional work due to the bakery law.

In the work connected with the manufacture of arsphenamine, one male laboratory assistant left and was not replaced because of improvements made in the processes which reduced the amount of work. Two female laboratory helpers left and were replaced by the transfer of one from the Antitoxin Laboratory. A change in the method of ampouling the drug has reduced the amount of work.

The following table gives a comparison of the work done during the past five years: —

	1916.	1917.	1918.	1919.	1920.
Milk samples,	7,958	7,060	7,738	9,576	8,960
Food samples,	2,330	1,704	2,142	1,382	1,720
Drug samples,	874	794	396	262	220
Police samples,	232	360	210	1,511	1,644
Public welfare samples,	–	–	–	12	45
Total samples,	11,394	9,918	10,486	12,743	12,589
Prosecutions,	250	307	337	262	311
Fines imposed,	$8,021.80	$5,560.60	$8,143.10	$7,880.00	$10,068.18
Confiscations,	325	124	87	97	86
Weight of confiscated articles (pounds),	128,710	305,000	157,557	250,462	39,529[1]

[1] And 226 cans of apricots.

This table does not include any record of the cold-storage inspections, slaughtering inspections, bakery inspections or arsphenamine production. It should be noted that during the past year 45 analyses were made for the Department of Public Welfare. This was in connection with purchases made by that Department for the State institutions, the price to be paid for the articles being governed by the composition of the articles actually delivered.

The total number of samples collected was nearly as large as that collected last year. It should be borne in mind, however, that during the present fiscal year the railroad traffic was blocked for a considerable length of time, thereby rendering travel and collecting of samples difficult, and in some cases impossible; otherwise, the amount of work done would have been greater than that reported last year.

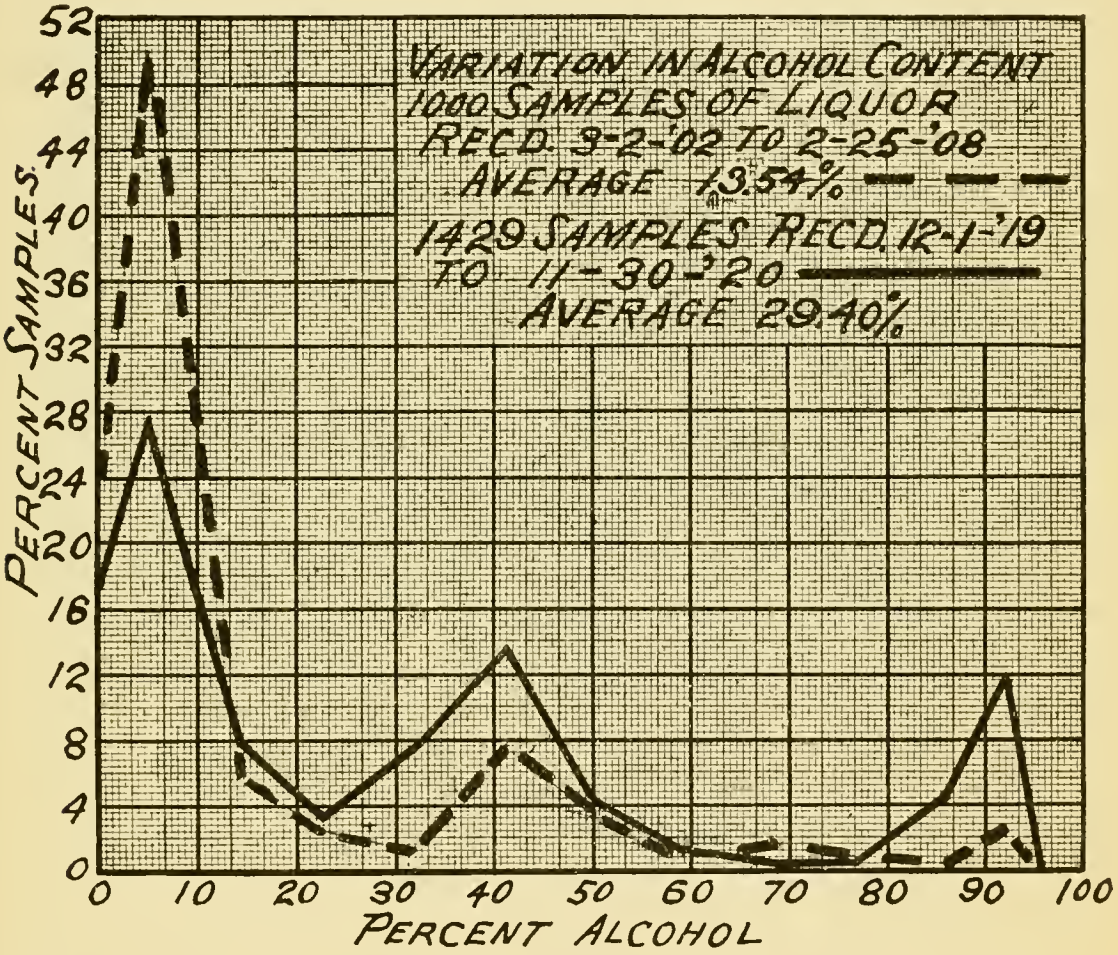
The number of court cases in 1920 was greater than in any year of the five-year period, and the fines were the heaviest. This is due, to some extent, to the violations of the cold-storage law, growing out of the fish cases tried last year by the Attorney-General, upon which cases sentences were not imposed until the present fiscal year.

The number of confiscations and amount of confiscated food is much less than in former years.

The following table gives a summary of the court cases disposed of during the year: —

	Conviction.	Not Guilty.	Nol-prossed.	Filed without Plea.
Milk: —				
Low standard,	23	1	–	–
Cream removed,	6	–	–	–
Watered,	77	4	1	–
Cream: —				
Low standard,	1	1	–	–
Adulterated food,	33	4	–	–
Misbranded food,	13	–	–	–
Decomposed food,	12	–	–	–
Violation of food regulations,	3	1	–	–
False advertising of food,	5	–	–	–
Cold-storage eggs not so labeled, in many instances sold as fresh eggs.	71	1	–	–
Other cold-storage violations,	26	1	1	2
Slaughtering violations,	23	–	–	–
Obstruction of inspector,	1	–	–	–
Totals,	294	13	2	2

The police authorities have submitted 215 samples which were examined for poisons. Of these samples, 107 were morphine, 1 was codeine, 1 was heroin, 1 was a morphine derivative obtained in insufficient quantity for complete identification, and 2 were opium, making 112 samples of opium and its derivatives. There were 66 samples of cocaine, 1 of strychnine, 1 sample of aloes and ferrous carbonate pills, 1 sample of griddle cakes which contained arsenic and 34 samples which were examined for poisons, with negative results. A sworn certificate of the analysis is delivered to the officer leaving



the sample, which certificate, in most instances, is accepted in court, but in a few instances the analyst is summoned to appear as a witness at the trial.

The amount of liquor submitted by the police has been unusually large. In fact, the number of samples has been greater than that submitted last year. This Department has been doing this work since 1902. Between 1902 and 1918, the maximum number of samples submitted was 238 in 1904, and the minimum was 51 in 1916. In 1919 there were 1,411 samples submitted, nearly all of which were re-

ceived after July 1. It was explained in the report for 1919 that this was due to samples submitted by the Internal Revenue Department to the police officers of the cities and towns in Massachusetts. This was stopped during the present year because of a change in the law which permitted the Department to refuse to examine any sample of liquor submitted by the police authorities unless the Department was satisfied that the analysis was to be used in the enforcement of criminal law in the Massachusetts courts. All the samples examined this year have been samples which the Department could legitimately analyze.

Cities sending more than 100 samples each were Boston, Lynn and Cambridge. Localities submitting more than 24 samples each were Gloucester, Lawrence, Fall River, Chelsea and Lowell. Boston and Lynn submitted samples each month during the year. Cambridge submitted samples each month in the year except two.

There were in all 50 cities and towns submitting samples. Of the samples submitted, 108 were classified as beer, 47 as cider, 165 as wine, 248 as whiskey, 207 as Jamaica ginger and 454 as miscellaneous. Most of these miscellaneous samples were distilled liquors of some sort. Of these samples, 256 contained less than 1 per cent of alcohol.

A chart has been prepared showing the variation in alcohol content of the samples received during 1920 in comparison with the variation in alcohol content of the first 1,000 samples of liquor received. It will be noted that there has been a marked change in the character of the samples submitted. In former years nearly half the samples contained between 1 and 5 per cent of alcohol. During the present year less than 28 per cent of the samples were of such nature. Note the fact that the distilled beverages have more than doubled in comparison with those submitted in former years, and the heavy alcoholic preparations, such as ginger extracts and pure alcohol, are now nearly four times as much in quantity as were formerly submitted.

In this work the analyst or assistant analyst has always made a certificate as prescribed in the statutes. There was, however, an error made when the work was transferred from the Assayer of Liquors to the State Board of Health in not prescribing that the certificate of the assistant analyst or the analyst, as the case may be, should be *prima facie* evidence in court. This was discovered after the close of the fiscal year, and it will be necessary to request certain changes in our legislation to correct this defect, or there will be unusual demands upon the chemists of this Division to testify in court upon liquor cases.

Considerable co-operative work has been done during the past year. Analyses have been made for the milk inspectors or health officers of Barnstable, Lawrence, Newton, North Adams, Fitchburg, Weymouth,

Arlington, New Bedford and Woburn, and in many of these instances the chemists of this Department have testified in court for these milk inspectors or board of health agents.

The milk inspector of Springfield has notified the Department of violations of the milk law, which resulted in the prosecution of a farmer living outside the jurisdiction of Springfield and sending watered milk to the city of Springfield. The Fitchburg and the Fall River inspectors have furnished information of violations of the milk law where the persons involved were outside of their own jurisdiction.

The milk inspector of Somerville furnished the Department upon several occasions with complete evidence of the collection and examination of adulterated milk intended for sale in Somerville but produced in other cities and towns, and this Department has successfully prosecuted upon the evidence submitted.

The agents of the board of health of Newton submitted evidence of violation of the cold-storage law, and assisted the inspector of this Department in collecting evidence for prosecution. Owing to the death of Mr. Berg, the milk inspector of Worcester, the Department was requested by the agent of the Worcester Board of Health to make rather more examinations of milk sold in Worcester than were usually made. This request was complied with, resulting in the prosecution and conviction of a farmer living in Auburn, who was selling watered milk to a retail milk dealer in Worcester.

Rather more co-operative work than usual has been carried on between this Department and the United States Department of Agriculture. Several interstate shipments of adulterated olive oil have been found, the evidence collected, and turned over to the United States Department of Agriculture for prosecution. A shipment of wormy and decomposed cocoa beans was sent from Brooklyn, N. Y., to a cocoa factory in Massachusetts, and this Department was notified by the New York Health Department. A sample was taken by an inspector of this Department, which sample was submitted to the United States Department of Agriculture for examination, the goods being held under seizure by our inspector. Since a part of the shipment had been opened, samples for interstate work could be taken only from unbroken packages. The United States Department of Agriculture declined to proceed in this case to the United States courts since the ultimate disposition would be identical to the disposition ultimately carried out by this Department, namely, sorting the beans under supervision and destroying all those which were unfit for food. Samples were collected for the United States authorities in the town of Westfield.

There were 8,960 samples of milk examined, of which 8,614 were

collected by the inspectors. Of these samples, 6,159 were above the legal standard; 20 were skimmed milk sold in accordance with the law; 145 were samples from which a portion of the cream had been removed; and 582 contained added water. There was an unusually large percentage containing added water. This does not mean, however, that the quality of milk which has been sold in the State is lower than has been sold in the past. By following up the producers supplying milk dealers selling low standard milk, we have found a number of farmers selling milk containing added water, which milk when mixed with the milk of the other producers furnishing legal milk was not watered sufficiently to be detected in the mixture. Many of the dealers have been particularly helpful to the Department in assisting in this work.

Tables Nos. 1 and 2 give the summary of the milk statistics by months during the past year.

The average composition of milk not declared adulterated was rather better than during the past three years. These figures for the past twelve years are given in the following table: —

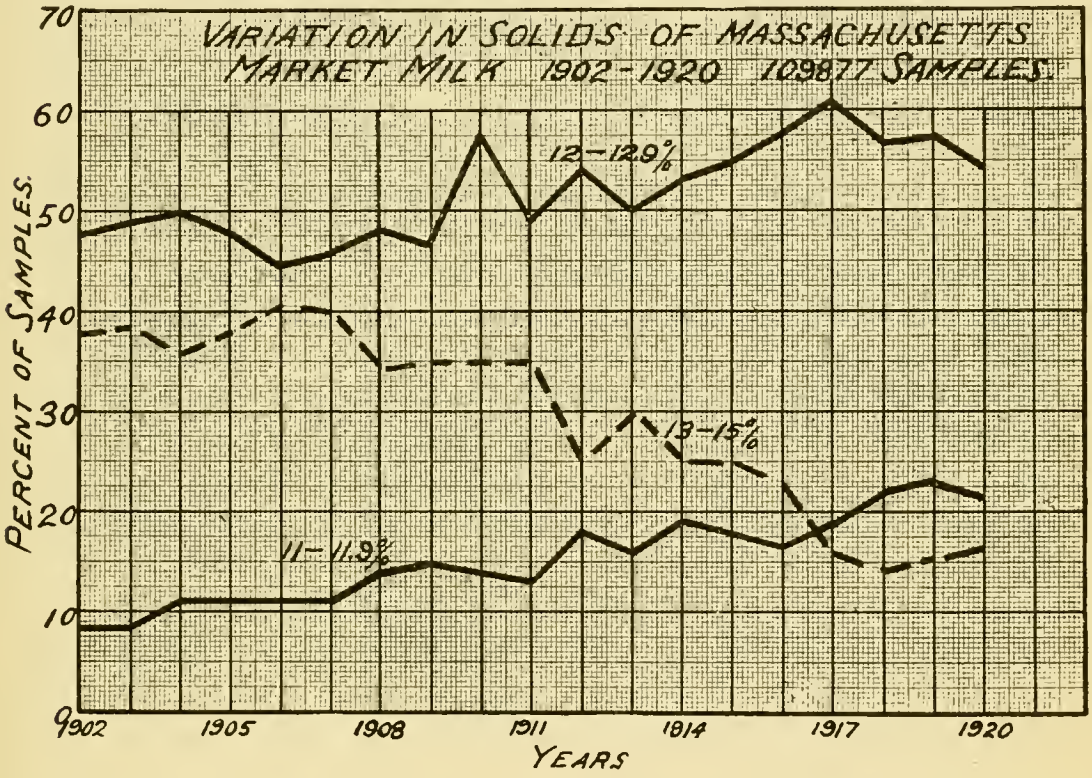
Average Composition of Milk not declared Adulterated.

Year.	Number of Samples.	Solids (Per Cent).	Fat (Per Cent).	Solids not Fat (Per Cent).
1909,	4,242	12.78	4.10	8.68
1910,	5,032	12.85	4.02	8.83
1911,	4,341	12.83	4.00	8.83
1912,	4,516	12.66	3.89	8.77
1913,	6,154	12.69	3.84	8.85
1914,	5,502	12.70	3.82	8.88
1915,	6,765	12.68	3.82	8.86
1916,	7,458	12.66	3.72	8.94
1917,	6,317	12.53	3.73	8.80
1918,	6,995	12.47	3.76	8.71
1919,	8,890	12.40	3.73	8.67
1920,	7,852	12.49	3.78	8.71

It will be noted that there has been a steady decrease in the composition of milk sold upon the market, but since the average is considerably above the legal standard, there seems to be no great need at present of any reduction in the standard, although it may be

possible that if the present slow decrease in the composition of milk keeps on, eventually some change may be desirable.

This Department has the most extensive and complete set of milk statistics of any similar Department in the country. A study of the figures for a number of years shows a gradual increase in the number of samples between 11 and 11.9 per cent total solids; a steady increase in the number of samples between 12 and 12.9 per cent solids, and a decrease in the samples between 13 and 15 per cent total solids. These figures have been plotted and are shown in the accompanying chart. By extrapolation upon this chart, it appears probable that in 1924 about 25 per cent of the Massachusetts market



milk will have solids between 11 and 11.9 per cent; about 63 per cent of the milk will have solids between 12 and 12.9 per cent; and only about 8 per cent of the milk will have solids above 13 per cent. The increase in the milk between 11 and 11.9 per cent is due to the increase in the number of Holstein cows, which give the greatest quantity of milk with the lowest quality of any breed of cattle. The decrease in the milk above 13 per cent solids is due to a decrease in that type of cattle giving milk of high quality, and it is also due to the disappearance of the small dealer handling milk from but few producers. The increase of the samples between 12 and 12.9 per cent solids is due to the decrease in the small dealers and corresponding

increase in quantity of milk sold by large dealers; the milk sold by the large dealers being mixtures of milk of varying quality is invariably between 12.2 and 12.8 per cent solids, while the milk sold by small dealers is liable to vary between 11.8 and 13.5 per cent.

This consolidation of the milk business in the hands of large dealers probably will have a tendency to cause a decrease in the sale of milk between 11 and 11.9 per cent solids, as well as a decrease in the sale of milk above 13 per cent solids.

In the Journal of Industrial and Engineering Chemistry for 1914 (page 899) the Director of the Division published an article upon the composition of milk. The article resulted from the compilation of the analyses of about 500 samples of milk of known purity, of which 63 represented herds and the balance represented milk from individual cows. A summary of this work will be found in the report of the State Board of Health for 1913.

The conclusions recorded in the article were based upon the best judgment of the results obtained and were not intended to represent the last word upon milk analysis and milk composition, neither were they intended to give milk handlers the right to adulterate the product they sold until it conformed with the worst milk that could be produced by a cow or a small herd of cows and to use the conclusions of the article as evidence in court that the adulterated milk was pure.

The adulteration of milk with water is risky, and will eventually be detected, although the profits are high and the detection of small quantities of added water is difficult, and in many instances impossible.

Adulteration by the removal of cream or, in other words, by the addition of skimmed milk is highly profitable, is difficult of detection and probably is not uncommon. Owing to the demand for cream there is a large surplus of skimmed milk left upon the dealers' hands, and it is much more profitable to pass this on to the consumer as whole milk at 19 cents per quart than as skimmed milk at 5 cents per quart, particularly since the public has not shown any desire to purchase this skimmed milk at the prices at which the dealers desire to sell, and this skimmed milk therefore is practically a waste product.

In the conclusions of the article referred to, the following statements occur: "The protein-fat ratio in all cases has been less than 1. If this figure exceeds 1, skimming is indicated, the amount being greatest in samples possessing the highest ratio." "If the protein-fat ratio is less than 0.7 or the percentage of fat in the solids is above 35.0, samples may be declared watered by a low refraction of the serum, not necessarily below the minimum for all samples of known purity. This is particularly true when dealing with herd milk."

The legal mind has attempted to misconstrue the first statement by claiming that it is capable of converse construction, and means that if the protein-fat ratio is less than one the milk is pure. The falseness of this contention can be easily understood by any one of average mentality, particularly so when one realizes that the average market milk has a protein-fat ratio of 0.82 and the mixed milk of the Guernsey and Jersey type of cows has a protein-fat ratio as low as 0.6. Considerable skimmed milk therefore can be added to such milk before the ratio of proteins to fat reaches one. Milk with a fat content of 4 per cent and a protein-fat ratio of 0.82 can be adulterated with 15 per cent of skimmed milk and still possess a protein-fat ratio less than one. It is evident, therefore, that the use of a protein-fat ratio less than one as a criterion that milk is not skimmed is faulty, and, therefore, when dealing with the composite milk of a number of herds it is reasonable to use a lower figure for the detection of skimming, particularly so if other figures point to the fact that the sample before being tampered with naturally had a low or average protein-fat ratio.

The second quotation reported here is of interest in this respect: that if milk of a low protein-fat ratio naturally possesses a high refracting serum, milk with a high refracting serum naturally possesses a low protein-fat ratio. In other words, it is not usual for milk to possess both a high refraction of the serum and a high protein-fat ratio.

In the samples referred to the copper serum refraction and the protein-fat ratio was determined upon 362 samples. The average protein-fat ratio has been computed for each 0.1 variation in the serum refraction, each computation representing from 1 to 24, averaging 10.4 samples, and the results were plotted, from which a resultant of the averages was computed to show this relation if more samples had been available.

From this computation the following deductions were drawn: —

In all cases when the average protein-fat ratio was above 0.85 the average refraction was below 37. In all cases when the average refraction was above 38 the average protein-fat ratio was below 0.81. Deductions from the computed averages indicate that mixtures of milk from many dairies with a copper serum refraction above 38 would have a protein-fat ratio less than 0.80, and it therefore may be assumed that milk representing a composite sample from many dairies, with a protein-fat ratio of 0.90 or above, has in some manner been diluted with skimmed milk, particularly so if the refractive index of the copper serum is 38 or above.

The above statements are from an article prepared in 1919 and withheld from publication in order that a more detailed study be given to the protein-fat ratio of milk and its relations to various other milk ingredients. As first shown by Van Slyke[1] the protein-fat ratio is a characteristic of the breed, and in all natural milk less than one; if it exceeds one, skimming is indicated. This has been confirmed by work of the Massachusetts Department of Public Health. Other variations of the protein-fat ratio possibly of minor character, but, nevertheless, of significance, are variations with changes in solids, fat and serum refraction, as well as variations in herd milk compared with that from individual cows. All these variations have a bearing upon the interpretation of analyses when the possibility of skimming is to be considered and the protein-fat ratio is less than one.

In order to properly compile and study these variations the arithmetic probability paper of Hazen & Whipple was employed. For a complete description of this paper and of the mathematical principles upon which it is constructed see "The Element of Chance in Sanitation," by George C. Whipple.[2] The ordinates of this paper may be either arithmetic or logarithmic, but the abscissæ constitute a probability scale of such nature that if "the items of a serious observation plotted on this paper fall in a straight line it indicates that they form a probability series. That is, they occur according to the laws of chance."

In all statistical work a large series of observations are desirable for satisfactory work, but by the use of this paper in the case of a relatively small number of observations, it is possible to ascertain whether or not the observations are of such a nature that conclusions can be drawn from them. In other words, this paper eliminates the freaks from a series of observations.

In carrying out this study I had at my disposal the analyses of the milk of over 1,000 individual cows and of 116 herds, the samples being milked in the presence of an inspector or a chemist of the Massachusetts Department of Public Health. The cows were representations of all the usual dairy breeds and cross-breeds; they were of various ages; represented all periods of lactation; and the samples were collected at all seasons of the year.

A study made in 1919 of the herd milk figures gave the surprising information that, although the average protein-fat ratio is about 0.83, 11 per cent had a protein-fat ratio of above 0.90, and, except for the maximum value 0.96 and the 3 minimum values 0.55, 0.56 and 0,60,

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[1] Journal American Chemical Society, 30, 1166.

[2] Journal Franklin Institute, July and August, 1916.

the data plotted approximately upon a straight line on the probability paper. A subdivision of these figures into milk below 12 per cent in solids and above 13 per cent in solids showed a much larger percentage of milk with high protein-fat ratio in the case of those samples below 12 per cent than in the case of the entire number. For example, 3 per cent of the samples above 13 per cent in solids had a protein-fat ratio above 0.90, and 13 per cent of those below 12 per cent in solids were above 0.90, and of those between 12 and 12.9 per cent solids 20 per cent were above 0.90. This compilation of samples below 12 per cent in solids, representing but 13 samples, does not plot in a straight line, and, therefore, definite conclusions cannot be drawn from these figures; but from the similarity between the different plots with the same general direction in all cases, it is evident that the per cent of samples with high protein-fat ratio in herd milk with solids less than 12 per cent must necessarily greatly exceed that in herd milk above 12 per cent in solids. It appears from the figures in Chart I that it is impracticable to call commercial milk skimmed if relying entirely upon a protein-fat ratio between 0.90 and 0.98.

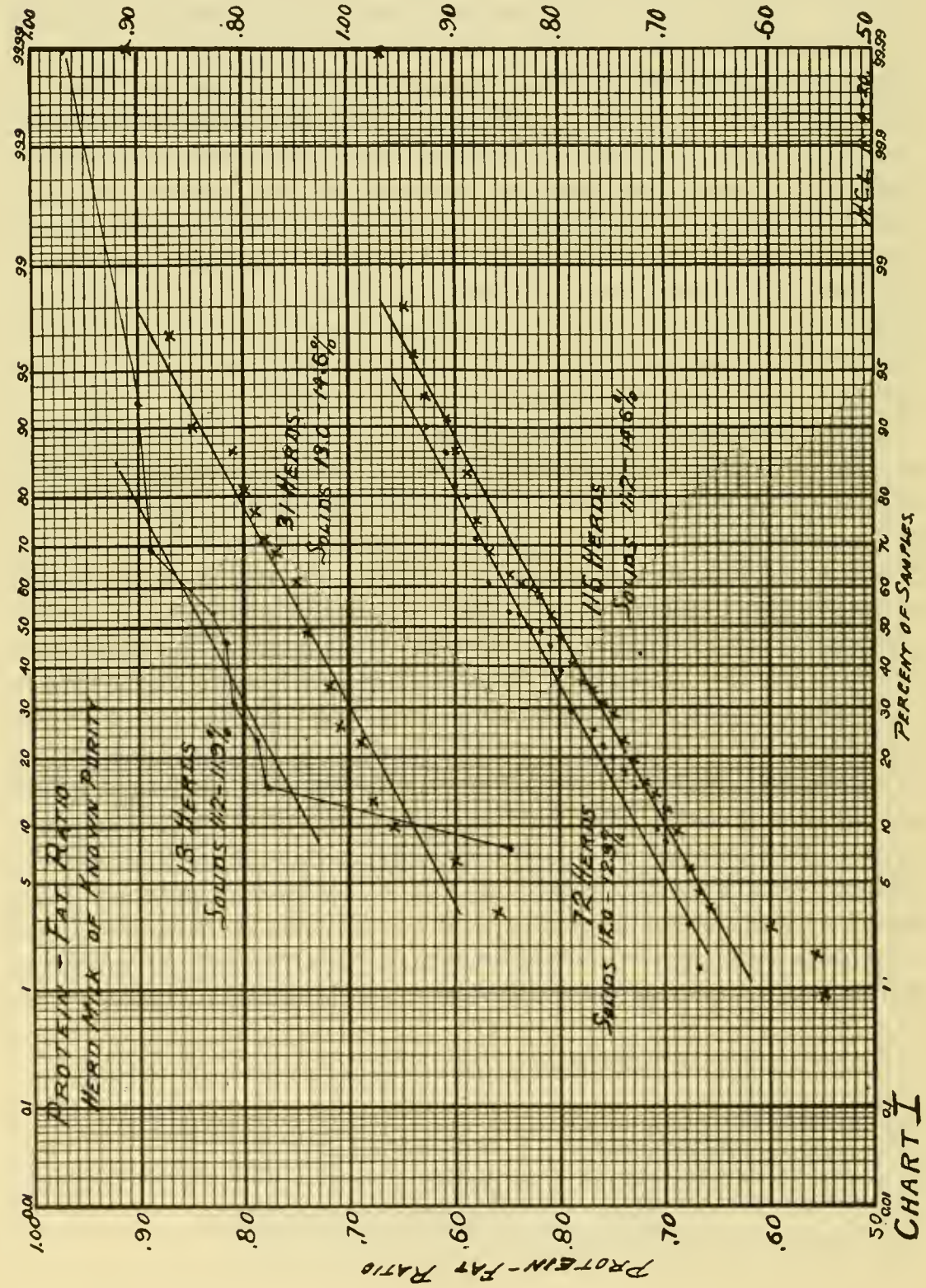
A more complete study of the protein-fat ratio was made specifically in relation to its variation with breed, solids, fat and copper serum refraction; and the comparison between milk from individual cows and from herds. Chart II gives the comparison of milk from 746 individual cows with that from 116 herds. It will be noticed that while a large number of low protein-fat ratios found in individual cows disappear in herd milk, a much less number of the high ratios disappear in the herd milk. This is in marked contradistinction to other figures, such as solids and fat taken from analyses of the same samples, in which cases about equal quantity of high and low figures in milk from individual cows are not to be found in herd milk. This is further emphasized by the fact that the median, which in these figures closely approximates the average, is about 0.80, while the arithmetic mean of the maximum and the minimum is about 0.70, showing a far greater preponderance of milk with a high protein-fat ratio than with a low protein-fat ratio. It is possible that the underlying cause for this condition is due to the preponderance of certain breeds of cattle.

The 746 samples from individual cows were obtained according to breeds, as follows: —

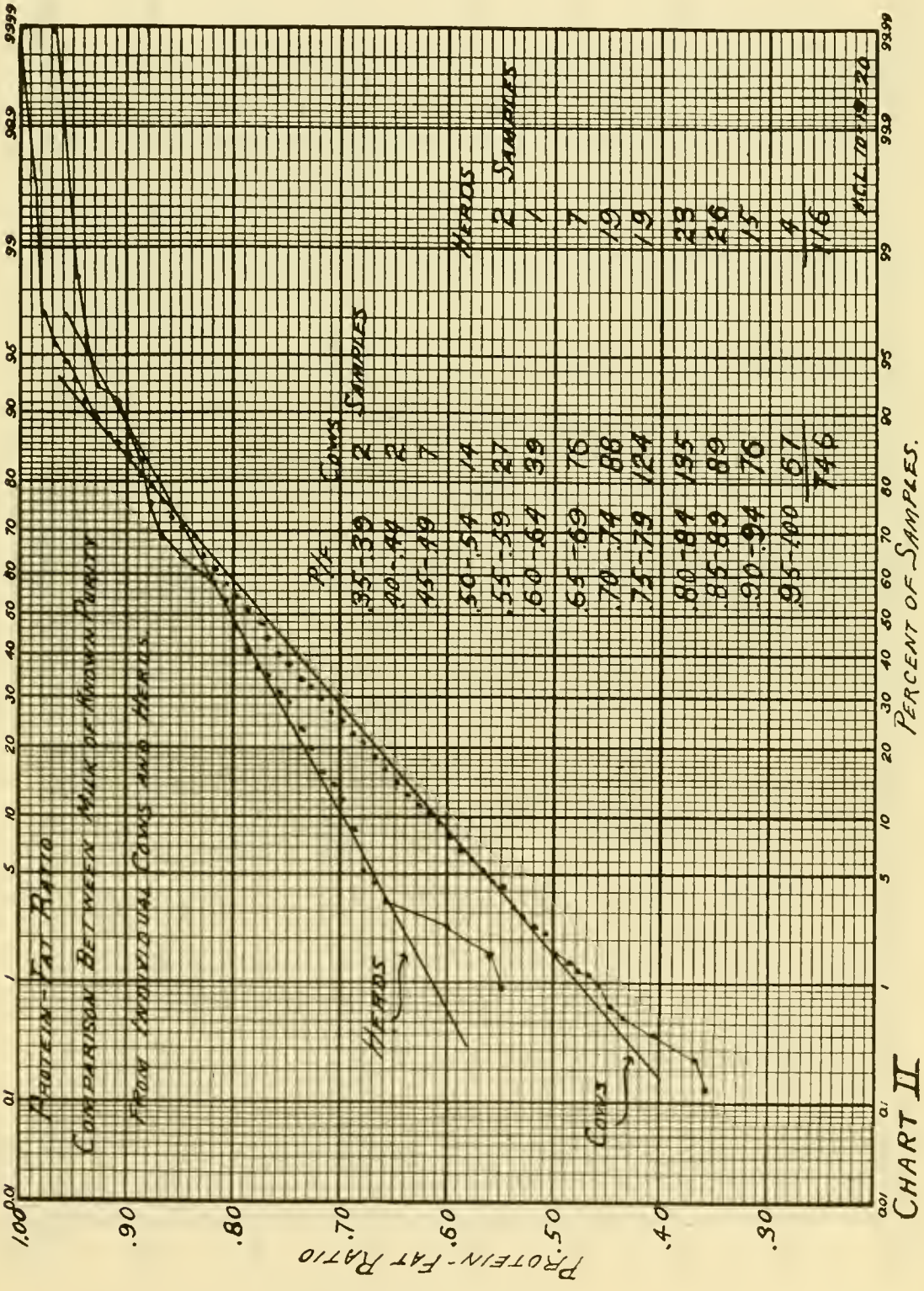
From pure-bred Holsteins,	167
From pure-bred Ayrshires and a few grades,	126
From pure-bred and grades of the Jersey and Guernsey types,	180
From grade cows of the Holstein type,	273

A study of the variation in protein-fat ratio in relation to the breed showed that in the Holstein breed 25 per cent, in the Ayrshire breed 13 per cent and in the Jersey and Guernsey breeds 5 per cent of the cows gave milk with a protein-fat ratio above 0.90.

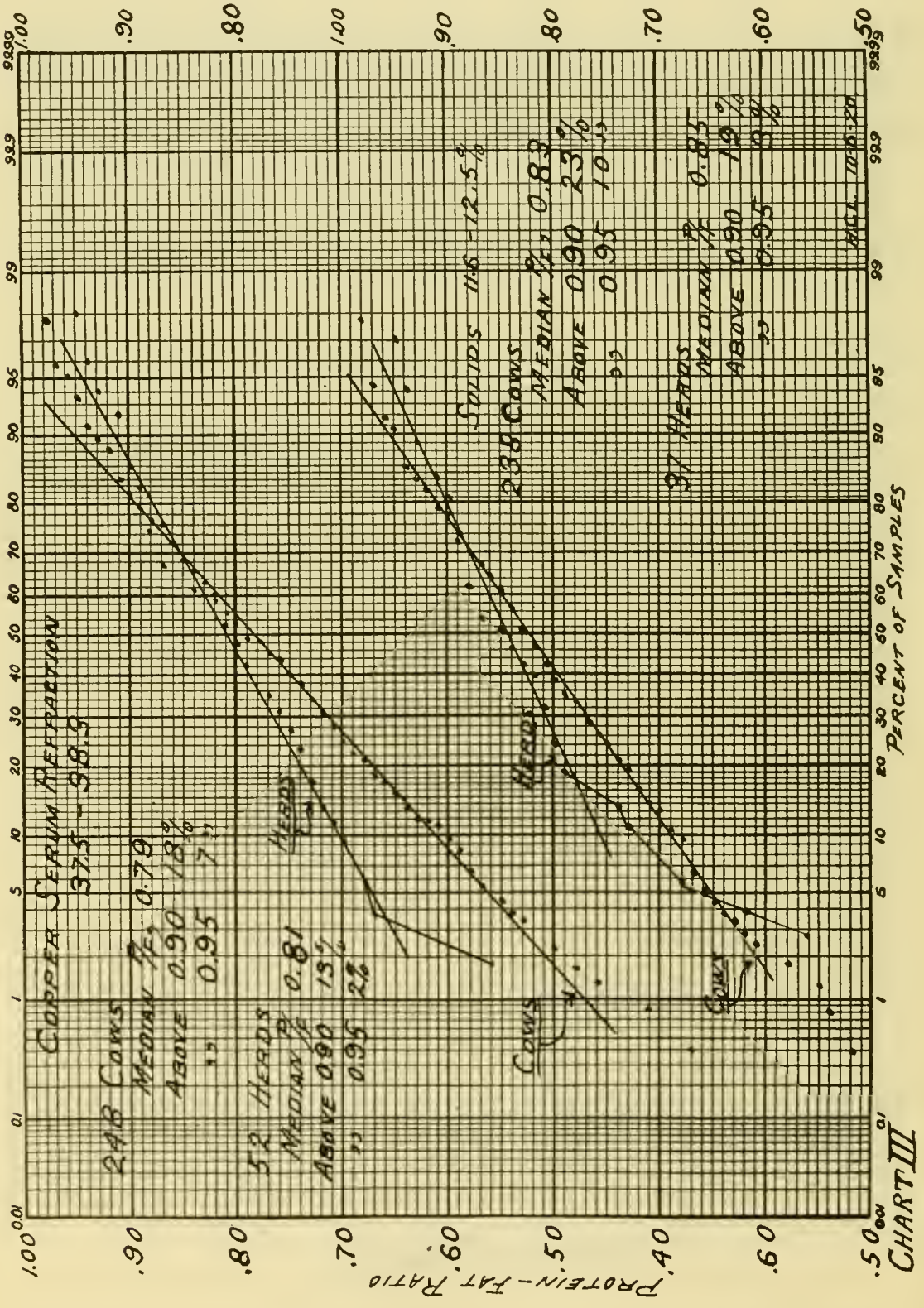
It is evident that the question of breeds must be eliminated if



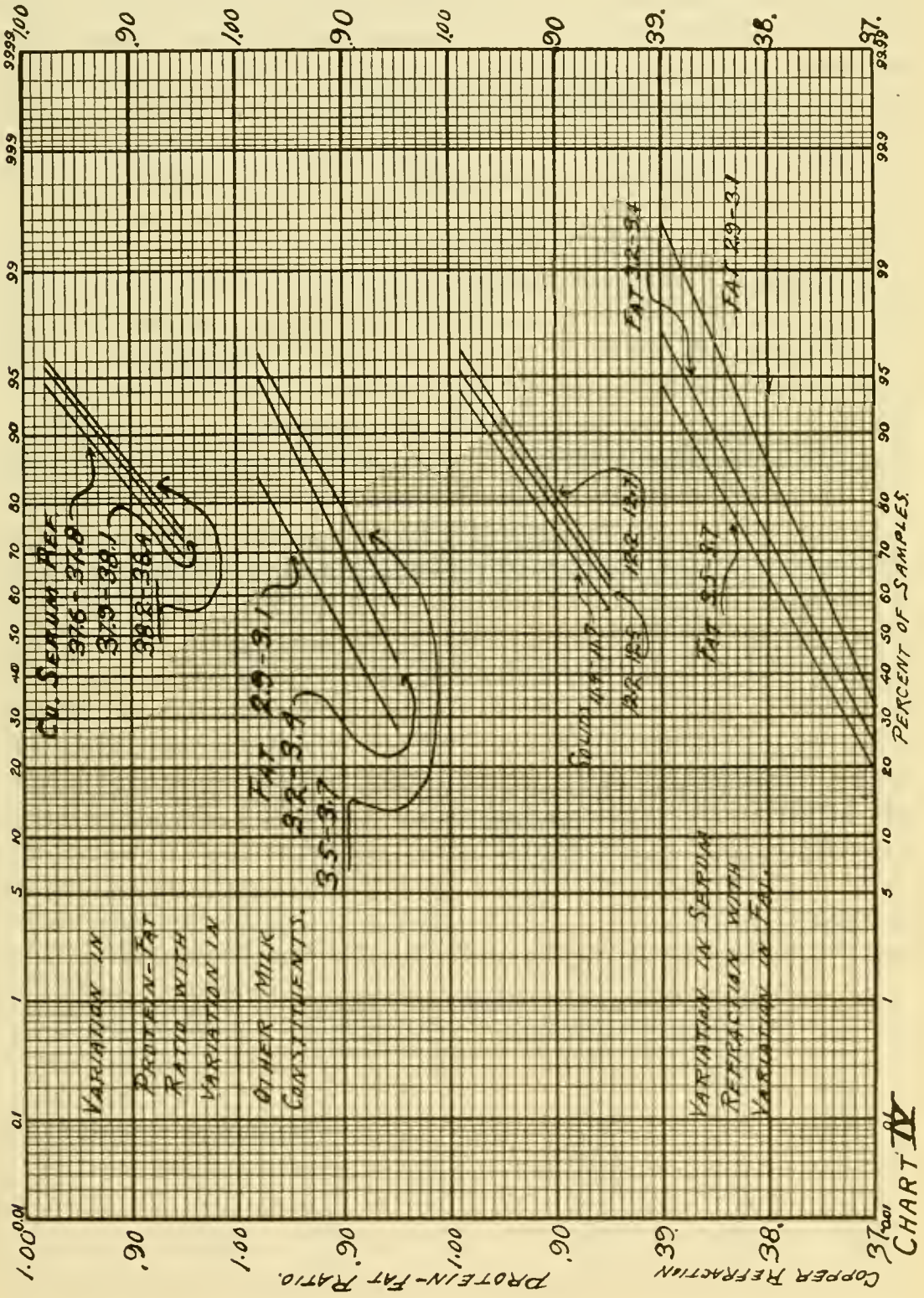
figures below 0.99 are to be used in detecting skimming, and, therefore, the protein-fat ratio was studied in respect to its variations with variations in other milk constituents, and it was found that the protein-fat ratio was to some extent a function of the fat, of the copper serum refraction, and to a less extent of the solids.



The samples were grouped as above and below 12 per cent solids, as per varying fat content, as per varying copper refraction of the milk serum, and the variation in protein-fat ratio was plotted. The relative variation of the copper serum refraction with different fat percentages was also plotted. These studies all illustrated the pre-



ponderance of high protein-fat ratios in contradistinction of those of low protein-fat ratios, and also showed that more low and less high protein-fat ratios disappeared in herd milk. Thirteen per cent of the samples with copper serum refraction from 37.5 to 38.3 were above 0.90 in protein-fat ratio, thus showing the fallacy of the conclusions in the preliminary discussion of this question.



It is manifest that conclusive opinions relative to the removal of cream cannot be given in the cases referred to unless they occur so extensively that the probability of their natural occurrence has been eliminated by an overwhelming number of samples of unusual composition. For comparative purposes and for ease of study that portion of the variation of the protein-fat ratio between 0.85 and 0.99, as compared with variation of serum refraction, fat and solids, together with the variation of the serum refraction between 37 and 39, as compared with the variation in fat, will be found in Chart IV. The plots being prepared, largely from analyses of individual cow's milk, should give sufficient margin of safety for conclusive opinions.

The figures presented are the analyses of three samples of milk of known purity and the computed analyses resulting from assumed skimming.

From Table III, in the publication previously referred to, showing the expected relation between the fats and solids, samples B, E and F are highly suspicious of being skimmed. The protein-fat ratio alone indicates nothing except suspicion in the cases of examples B, D and F. The figures on page 153 are computed from Chart IV, and show the probability expressed in per cent of these figures occurring.

In the cases of examples E and F the very low frequency of these copper refraction and fat figures occurring at the same time, taken with the other data, is sufficient evidence to call the samples skimmed. In the cases of A and B, notwithstanding the high frequency of the occurrence of the observed protein-fat ratio compared with the fat, such samples may be declared skimmed if obtained from one dealer in sufficient quantities to overcome the probabilities of the copper refraction-fat comparison and the copper refraction comparison with the protein-fat ratio being natural. In the case of example C the sale of such milk should be almost a continual performance before skimming could be proved, and in the case of example D at least 15 per cent of the samples obtained from the dealer should be like the example.

Solids.	Fat.	Proteins.	Protein-Fat.	Copper Refraction.	Cream removed (Per Cent).	Fat corresponding to Solids not less than —
12.07	3.55	2.68	.76	38.3	None	3.30
11.42	3.00	2.68	.89	38.3	15 — A	2.90
11.22	2.80	2.68	.96	38.3	21 — B	2.80
12.40	3.60	2.99	.83	38.0	None	3.60
12.10	3.30	2.99	.91	38.0	8 — C	3.40
11.90	3.10	2.99	.96	38.0	14 — D	3.20
13.30	4.00	2.86	.72	39.5	None	4.10
12.50	3.20	2.86	.89	39.5	20 — E	3.60
12.30	3.00	2.86	.96	39.5	25 — F	3.50

Probability of protein-fat	.89 occurring with copper refraction of	38.30,	16%
Probability of protein-fat	.89 occurring with solids of	11.42,	30%
Probability of protein-fat	.89 occurring with fat of	3.00,	55%
Probability of copper refraction	38.30 occurring with fat of	3.00,	6%

A—15% skimmed.

Probability of protein-fat	.96 occurring with copper refraction of	38.30,	5%
Probability of protein-fat	.96 occurring with solids of	11.22,	11%
Probability of protein-fat	.96 occurring with fat of	2.80,	20%
Probability of copper refraction	38.30 occurring with fat of	2.80,	6%

B—21% skimmed.

Probability of protein-fat	.91 occurring with copper refraction of	38.00,	15%
Probability of protein-fat	.91 occurring with solids of	12.10,	19%
Probability of protein-fat	.91 occurring with fat of	3.30,	25%
Probability of copper refraction	38.00 occurring with fat of	3.30,	26%

C—8% skimmed.

Probability of protein-fat	.96 occurring with copper refraction of	38.00,	6%
Probability of protein-fat	.96 occurring with solids of	11.90,	8%
Probability of protein-fat	.96 occurring with fat of	3.10,	12%
Probability of copper refraction	38.00 occurring with fat of	3.10,	14%

D—14% skimmed.

Probability of protein-fat	.89 occurring with copper refraction of	39.50,	10%
Probability of protein-fat	.89 occurring with solids of	12.50,	24%
Probability of protein-fat	.89 occurring with fat of	3.20,	34%
Probability of copper refraction	39.50 occurring with fat of	3.20,	.6%

E—20% skimmed.

Probability of protein-fat	.96 occurring with copper refraction of	39.50,	4%
Probability of protein-fat	.96 occurring with solids of	12.30,	8%
Probability of protein-fat	.96 occurring with fat of	3.00,	22%
Probability of copper refraction	39.50 occurring with fat of	3.00,	.07%

F—25% skimmed.

Protein-fat ratio less than one is no criterion that milk is not adulterated.

The protein-fat ratio is a function of the solids, fat and serum refraction, as well as of the breed; and when less than one, if used in the interpretation of analyses, should be studied in relation to such figures of which it is a function.

Milk representing the mixed milk of many dairies can be declared skimmed when the protein-fat ratio is less than one; provided, however, that other analytical data is obtained to substantiate the conclusion, and provided, further, that a sufficient number of samples have been obtained to exclude the probability of the natural occurrence of such milk.

Owing to the greater prevalence of high protein-fat ratios compared with low protein-fat ratios in milk from the average dairy herds, it is inaccurate to assume that the mixed milk of a number of herds would not greatly exceed in protein-fat that of the average protein-fat ratio of the analyses on record.

In comparing the composition of milk from individual cows with milk from herds both the maximum and minimum figures obtained from individual cows, as a rule, are not found in herd milk; the protein-fat ratio, however, is an exception, for but few of the highest figures so disappear because of greater frequency of protein-fat ratios above the average.

There were 1,720 samples of food collected for examination, of which 502 were adulterated. The list of foods examined is given in Table No. 3. Of 36 samples of butter examined, 6 were found to be either rancid or to be of high moisture content. Some of the rancid samples were submitted by the public. A hotel keeper was convicted for serving butter which was one-half milk. One of the guests at the hotel made a complaint and an inspector of this Department went to the hotel, obtaining the necessary evidence.

There were a number of samples of clams collected, many of which were found to contain added water. Some of these clams were shipped from New Hampshire, and in those instances arrangements were made whereby this Department assisted the United States Department of Agriculture in collecting evidence for reference to the United States courts. A number of cases were tried, some of which were acquitted. The justice of the Chelsea Police Court found the defendants not guilty on the ground that the addition of water to clams was a good thing. The justice of the Newburyport Court stated that assuming the truth of the contention of the defendants that it was necessary to add water to clams in order to keep them from spoiling, it would in no way affect their criminal liability for selling adulterated food.

One of the clam dealers at the hearing given by the Division director stated that it was necessary to put a cake of ice in the clams in order to keep them from spoiling. When he was asked if the same procedure was necessary in the case of milk, he said it would take too much ice to put around the cans in order to keep the clams. The analogy is apparent. When a cake of ice is placed in some fresh opened clams, the ice will eventually melt and will be absorbed by the clams. When a cake of ice is placed in a can of milk the ice will eventually melt and will be absorbed by the milk. Clams under this treatment will absorb nearly an equal quantity of water; therefore, a citizen buying a quart of soaked clams gets a pint of water and a pint of clams.

A number of samples of dried fruits were obtained from retail stores and were found to contain sulphur dioxide, the dried fruits being sold without the necessary label. Hearings were given to the dealers, and the subject was then taken up with the Retail Grocers' Association, and a representative of the dried fruit interests. This

resulted in a letter being sent to the grocers by the secretary of the association, calling attention to the necessity of stamping the packages in which such articles were sold. Subsequent collections indicated that the grocers were complying with the law.

There were 288 samples of eggs collected, of which 193 were found to be in violation of the law. This does not mean that this ratio of good to poor eggs exists in the markets, since the inspectors of the Department have reason to suspect violations, and wherever their experience leads them to the belief that the dealer is complying with the law no samples are taken. This matter of poor eggs is difficult of control since it is confined only to the winter months of the year. In the spring and summer all the eggs sold are fresh eggs. They are delivered within a week or so of the time they are laid because they are produced in such quantities. In the winter months, however, the price of fresh eggs is very high because hens are not laying and in many instances the temptation of the small dealer to sell cold-storage eggs with a fresh egg label on them is too much.

A number of samples of adulterated olive oil were obtained during the latter part of the year. Complaints were received from certain dealers to the effect that there was a large amount of adulterated olive oil on the market. This Department investigated violations, which were traced back to a few wholesale dealers. These dealers have been prosecuted, but the cases were not completed during the fiscal year. There has been considerable difficulty in tracing shipments in barrels, which difficulty, however, has not been encountered in the case of shipments in cans. There were one or two cases where evidence of interstate shipment was secured, and this evidence was referred to the United States Department of Agriculture. The adulterants used were soy bean oil, corn oil and cottonseed oil.

A complaint was received from a citizen relative to a sample of salad dressing which he purchased, to the effect that it caused terrific physiological action to which he did not object, but he was curious to know what was the nature of the salad dressing because of difficulty involved in washing the clothing, there being grease spots which apparently could not be taken out by soap and water. The nature of the adulterant was at once evident and an inspector dispatched to the factory found that the proprietor was using white mineral oil instead of an edible oil in the manufacture of his salad dressing. Samples of all the salad dressings sold in the State were collected and the factories where they were made were inspected, and only in two small factories was this practice carried on. Both of these persons withdrew the article from sale, took back their old stock and destroyed it.

In the early part of the present fiscal year there was a strike in the packing houses in this State under United States inspection. This curtailed the number of sausages upon the market, and an investigation was made of sausages sold by those dealers not under United States inspection. It was found that most of them were taking advantage of market conditions and were using excessive amounts of starch or flour in their sausages. After they were all prosecuted, this practice ceased. Examinations of sausages made in the fall of this year showed that these persons were complying with the law.

A number of soft drinks were examined and many of them were found to contain saccharine. An attempt had been made to take up a test case on the validity of the regulations prohibiting the use of saccharine. These attempts were futile, and this year the Department began a systematic investigation of all the soft drinks sold or manufactured in this State. After the samples were taken hearings were held, and the manufacturers were notified of the fact that they were violating the law, and then second samples were taken. Wherever the second samples were found to be bad, prosecutions were instituted.

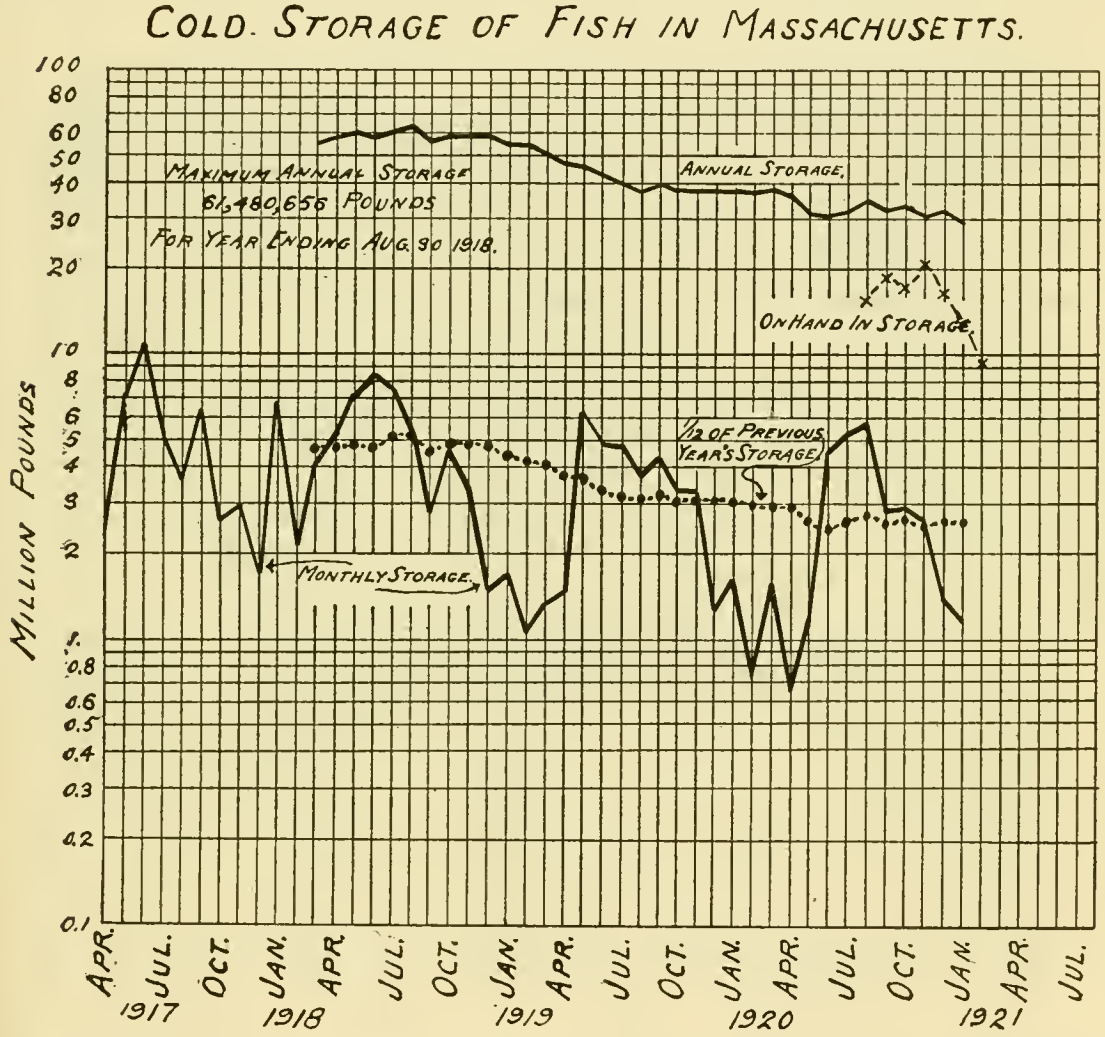
There were 220 samples of drugs examined, of which 20 were found to be adulterated. Of these samples, 10 were solution of magnesium citrate, 6 were spirit of nitrous ether, 2 were turpentine, 1 was denatured alcohol, and 1 was spirit of camphor. A few of these have not yet been disposed of, but all the other violations were taken care of by means of warnings or through hearings.

The various cold-storage warehouses located in the State have been inspected a number of times during the year, and have, in general, been found to be complying with the law. The depositors of cold-storage food have also been found to be, in general, complying with the law. A summary of the violations has already been given. It should be again noted, however, that many of the cases involved were sentences imposed on cases instituted during the previous year.

The warehouses first made quarterly reports of the amounts of food placed in cold storage, together with the amounts of butter and eggs on hand on the first day of the month in which the report was filed. A study of these statistics was printed in the 1916 report of the Department. Since April, 1917, the warehouses have reported monthly instead of quarterly the amounts of food placed in storage, and the amounts of butter and eggs on hand in storage the first day of each month. Since August, 1920, additional reports of holdings have been made upon all foods in storage. These latter statistics will be of greater value as time goes on, but their significance at present

is problematical because they cannot be compared with statistics of similar data for a period of years.

Massachusetts is engaged to a considerable extent in foreign commerce, in consequence of which a great deal of meat is stored here pending shipment to foreign countries. Meat intended for foreign shipment is shipped from Chicago to Albany, and stored there pending shipping facilities. It is then shipped to either Boston or New York, according to the availability of vessels for foreign shipment. This

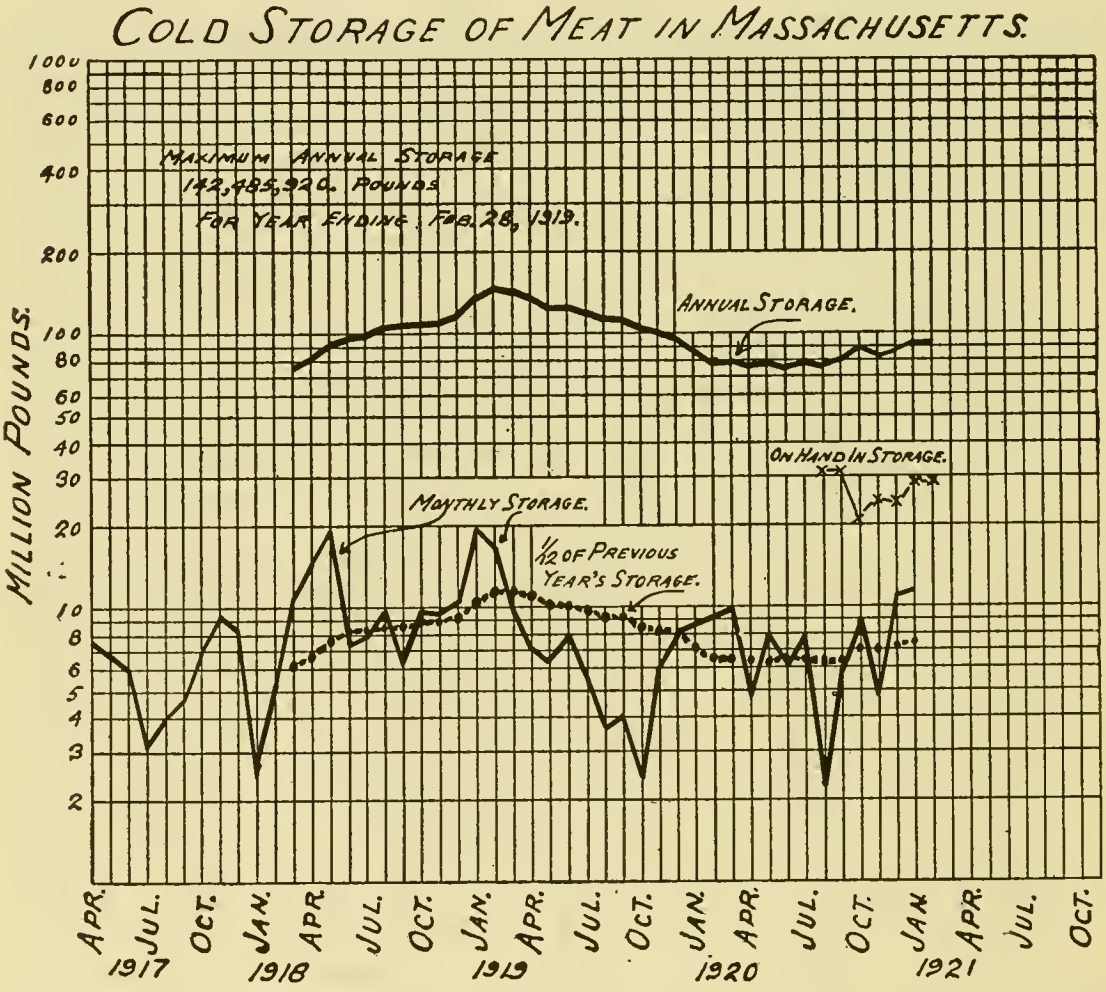


business, of course, has greatly increased since 1914, in which year, for the twelve months ending September 30, only 26,053,586 pounds of meat were placed in storage in Massachusetts. The volume of this business had increased so that during the twelve months ending Feb. 28, 1919, 142,056,249 pounds of meat were so stored. This has been reduced one-half since that time, the decrease during the present year being about 25 per cent.

Massachusetts is a fish-producing State; the larger part of the fish stored here Jan. 1, 1921, consisted of whiting, all of which is

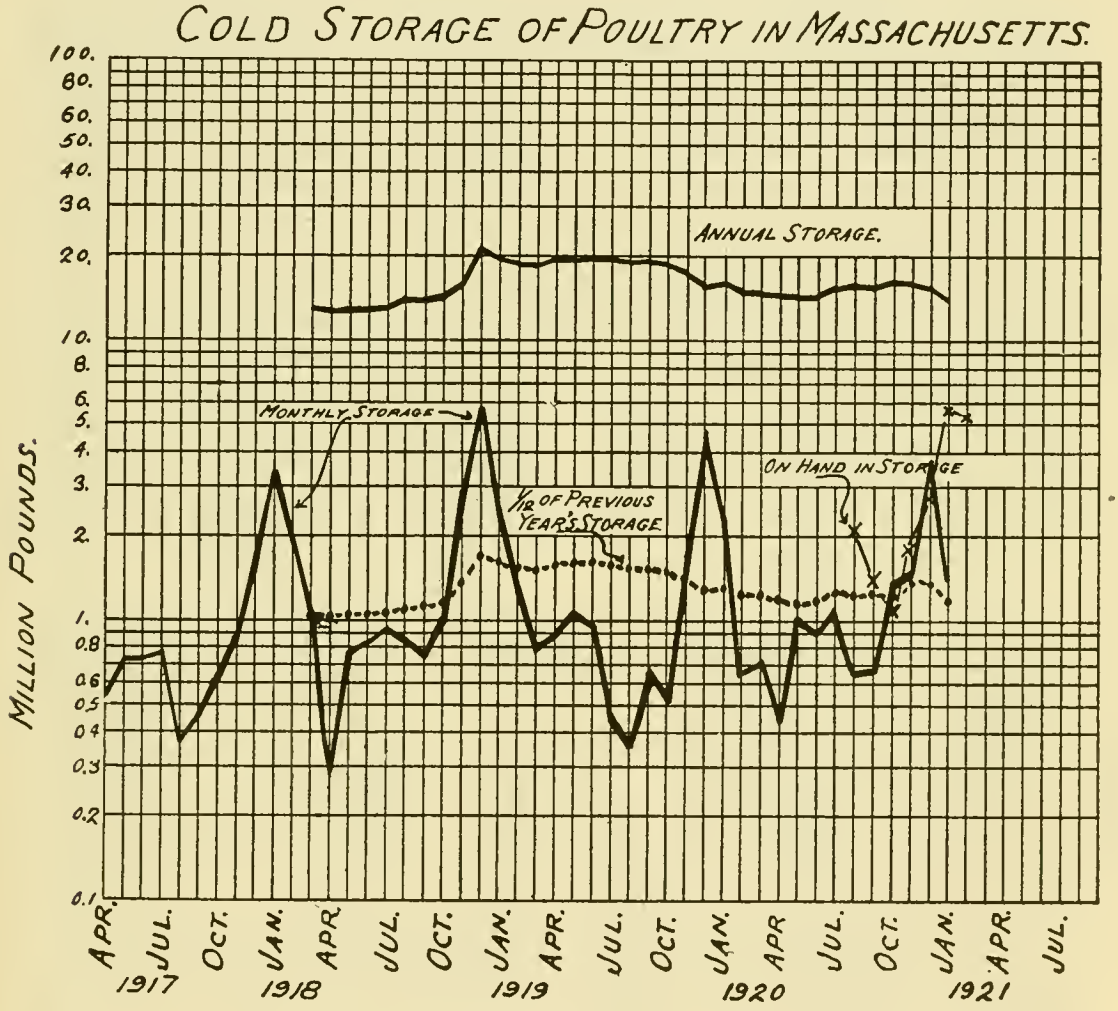
exported to other States. Considerable herring and squid for bait purposes, as well as for food purposes, constitute much of the balance of the fish so stored.

Three charts show statistics of storage of fish, meat and poultry in Massachusetts. They are prepared upon logarithmic scales rather than arithmetic scales, so that the annual as well as the monthly storage can be given upon the same chart; and so that comparison can be made of the rate of increase and decrease of storage. Since May 1 the Department of Public Health has received monthly reports



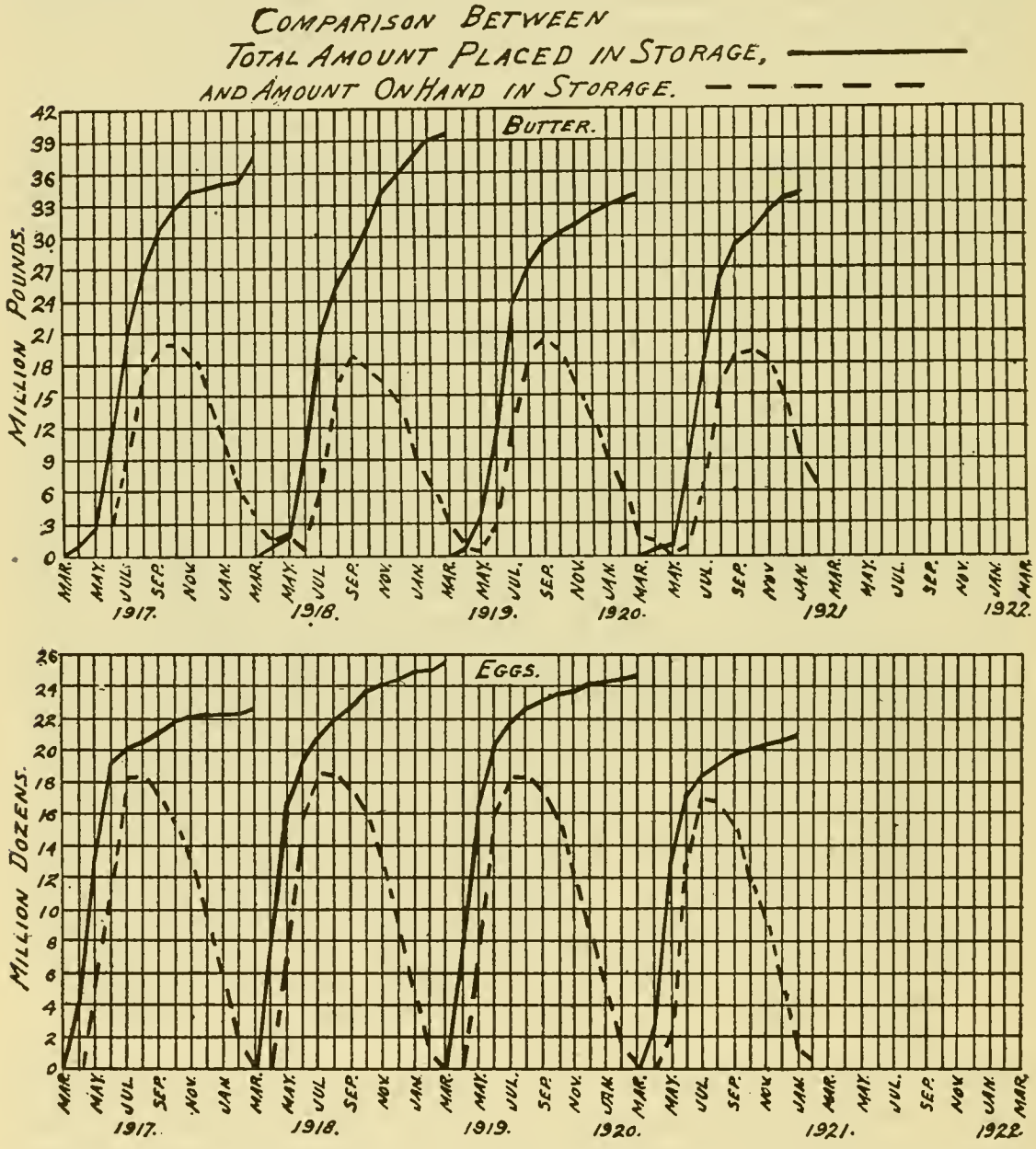
of storage of food in this State, and since Aug. 1, 1920, has in addition received reports of amounts of food on hand in storage. The variation in annual storage is shown by the upper line of each chart, each point giving the total annual storage for twelve months ending in the month designated. The dotted line is one-twelfth of the heavy line, and each point represents the average monthly storage for the twelve months ending in the month upon which it is plotted. This facilitates comparison of the actual storage each month with the average storage of the previous year. The fish chart shows a 50 per cent

reduction in the fish storage between 1918 and 1920. The highest annual storage was 61,480,656 pounds for the year ending Aug. 30, 1918, and the lowest storage was 30,806,150 pounds for the year ending June 30, 1920. The fish on hand in storage was apparently at its height this past year on November 1 when 66 per cent of the previous twelve months' storage was available. In all probability this will drop very rapidly and will reach a minimum about March 1. The meat chart, in a manner similar to the fish chart, shows a decrease in meat

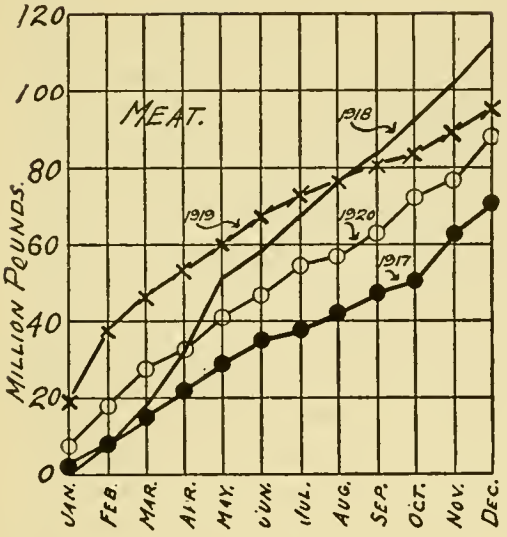


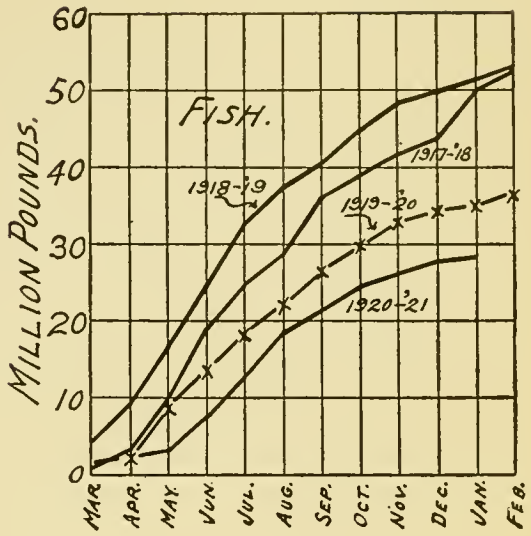
storage. In this case, the maximum annual storage was 142,485,920 pounds for the year ending Feb. 28, 1919, and the minimum annual storage was 77,387,110 pounds for the year ending June 30, 1920, and represented 54 per cent of the maximum annual storage. Although the amount of meat placed in storage appears at present to be slightly increasing, the amount on hand is considerably less than the annual storage; the highest figure so reported being that of August 1, representing 40 per cent of the previous twelve months' storage. It will be noticed that the maximum annual fish storage occurred shortly

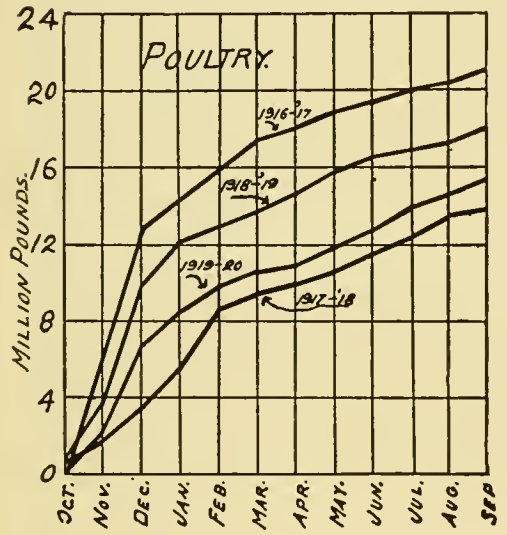
before, and the maximum annual meat storage occurred shortly after, the armistice. If these two plots are superposed so that the maximum figures coincide, and the horizontal dimensions are parallel, it will be seen that the descending parts of the two curves very nearly coincide, showing the same percentage of reduction in storage in the case of both meat and fish. The poultry chart, similar to the meat and fish

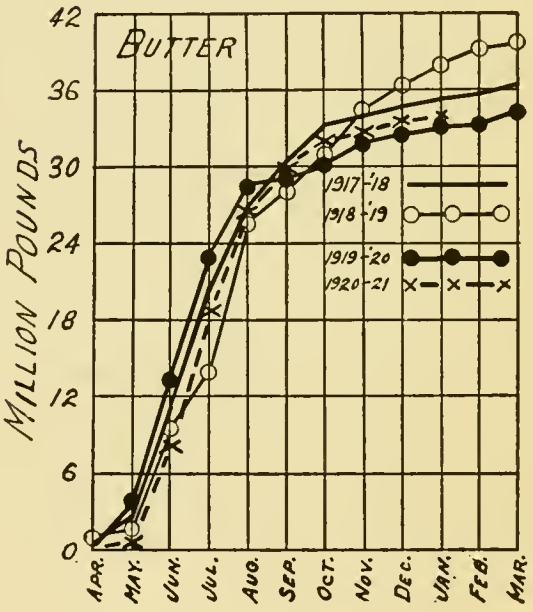


charts, tells a different story. The high points of monthly storage all occur in the months of November, December and January, when the roasters, fowl, turkeys, ducks and geese are stored. The low storage is in the spring month of April when the birds are laying eggs and raising their young. About June and July there is another increase in storage, slight, however, in this case, when the storage of broilers









FOOD PLACED IN COLD STORAGE IN MASSACHUSETTS IN FOUR YEARS.

CUMULATIVE DATA

MAXIMUM ANNUAL STORAGE PER CAPITA,

POULTRY:- YEAR ENDING DEC. 31, 1919:- $5\frac{1}{4}$ POUNDS.

BUTTER:- " " MAR. 31, 1919:- $9\frac{3}{4}$ "

FISH:- " " AUG. 31, 1918:- $15\frac{2}{3}$ "

MEAT:- " " FEB. 28, 1919:- $37\frac{1}{3}$ "

and superannuated male birds takes place. The holdings of storage poultry are probably at the lowest in October, and should be at the highest in January, February or March. It is not improbable that the poultry statistics may somewhat parallel those of the butter and egg statistics when sufficient data are available. For practical purposes it may be stated that all the poultry, butter and eggs stored here are consumed locally, the term "locally" being used to represent New England. The chart giving the holdings and cumulative storage of butter and eggs is based on the fact that the season for such storage begins in the spring. Note how the dotted lines showing the holdings on the first day of each month closely parallel the heavy lines showing the cumulative storage inclusive of the storage of the previous month.

In the case of eggs this condition continues for four months, and in the case of butter, for three months; but in the case of butter, the cumulative storage after the goods begin going out is much greater than in the case of eggs. Another chart shows the annual cumulative storage of meat, fish, poultry and butter during four years, and the total maximum annual storage per person. Note the variance in the storage of meat, fish and poultry in the different years, and note the comparative unity of this storage in the case of butter. The reasons for this variance have been previously given. The figures showing the maximum yearly storage per person indicate how little is the effect of this business upon each of us. Nine and three-quarters pounds of butter, and five and one-quarter pounds of poultry is not an unusual year's reserve supply for one person. The actual holdings per capita give a still more remarkable demonstration of the smallness of our reserve supply of perishable foods, and for the seven months are as follows: —

In Cold Storage Per Capita in Massachusetts.

Date.	Individual Eggs.	Butter (Pounds).	Poultry (Pounds).	Fish (Pounds).	Meat (Pounds).
1920.					
August 1,	48	4⅕	½	4	8⅕
September 1,	47⅘	5	⅓	4⅘	8
October 1,	36⅘	5⁸⁄₂₀	⅓	4½	5½
November 1,	30¼	4⁹⁄₁₀	⅖	5⅕	6⅕
December 1,	17½	3⅕	¾	4¼	6⅖
1921.					
January 1,	4⅔	2⅔	1⅔	3⅕	7½
February 1,	¼	1⅕	1⅔	2⅓	8⁹⁄₁₀

These figures seem unusually small when viewed individually, but if an average of the six months' holdings is taken and is multiplied by the number of persons in your family, you will see that it constitutes about one month's supply of the food in question.

There were 215 extensions of time in storage granted, 139 of which related to meat. This was mostly pork, namely, a special cut used only in the foreign markets. Under ordinary circumstances this would have gone abroad earlier, but owing to war conditions and possible difficulties in exchange, the British Ministry of Food declined to have the pork shipped until some time after the close of the year's storage.

A study of the storage extensions shows that each year the majority of extensions are applied to one article of food. In some years it is poultry, in other years butter, in other years fish, and in the present year it was meat.

There were 30 instances where extensions were not granted; 3 instances where permission was granted to remove goods from storage; and in 85 instances lots were ordered out of storage after they had been in storage for twelve calendar months. A summary of this part of the cold-storage work is as follows: —

Requests for extension granted,		215
Broken-out eggs,	6	
Butter,	4	
Game,	2	
Meat,	139	
Fish,	64	
Requests for extension not granted,		30
Broken-out eggs,	5	
Meat,	4	
Fish,	19	
Condensed milk,	2	
Requests for removal granted,		3
Butter,	2	
Meat,	1	
Ordered out of storage at the end of twelve months,		84
Broken-out eggs,	2	
Butter,	4	
Oleomargarine,	5	
Poultry,	12	
Game,	3	
Meat,	35	
Fish,	23	

Very few violations of the cold-storage law were found in retail stores, except those already noted in connection with the sale of cold-storage eggs. It is unfortunate that such eggs are not sold during the entire year. Under the present condition where such goods are sold for only about five months of the year, the dealers have seven months in which to forget the law.

The veterinary inspectors have been following out their usual work of examining the qualifications of local inspectors of slaughtering; acting as instructors to such inspectors; and investigating the conditions under which the local inspection is carried out. During the present year a number of violations were found in Berkshire County, and a number of cases were prosecuted, all of which resulted in conviction.

A case tried by the board of health of Orange showed the lax procedure which has been carried out by certain local boards of health regarding the appointment of inspectors. The inspector was called to a farm to inspect an animal about to be slaughtered. The animal was slaughtered in the presence of the inspector and condemned by him. As he was pouring kerosene upon the carcass, the owner of the carcass approached the inspector with a pitchfork and assaulted and battered him. The local authorities prosecuted the farmer for assault and battery and for obstruction of the inspector. This Department was represented both in the lower and Superior Court in connection with the case, and in the latter court was called upon to show that the inspector was a duly appointed inspector. The records of the Department showed that the inspector was nominated and was duly approved, but the records of the local board of health showed that he had been appointed two days before he was approved. Mr. Justice Callahan of the Superior Court then ordered the jury to bring in a verdict of not guilty in one of the cases since the inspector was not an inspector, he having been appointed before the State Department of Public Health confirmed the nomination. Incidentally, it might be stated that the jury convicted for assault and battery upon the inspector as a citizen.

As the result of this case, each local board of health was sent a form, which, when filled out, stated the name of the inspector, the date of his nomination, the date of his approval by this Department, the date of his appointment by the local board of health, and the date on which he was sworn into office by the local authorities. Judging from the many replies received to this circular, it was rather unusual for the local inspector to be properly qualified for the position.

During the past year the Legislature passed a new bakery law and repealed most of the old bakery laws. This law was introduced by one of the bakers' organizations, and had the unanimous support of

the other bakers. It introduces a new feature in health legislation, — that of supervision by the State Department of Health over the activities of local boards of health as far as bakeries are concerned. It also introduces a new feature of medical examination of workers in bakeries, such examination to be made upon the order of the boards of health. It further provides that regulations should be made by the Department of Public Health.

After this law was signed by the Governor, a number of conferences were held by representatives of this Department with various local boards of health and with various representatives of the baking industry, at which conferences all were requested to submit proposed regulations and to discuss the regulations thus submitted. Conferences were held in Springfield, Worcester and Boston, there being in all five such conferences.

A special committee of 15 was appointed to draft the regulations, and after these regulations were submitted they were put in final shape by Dr. Simpson, District Health Officer, and Mr. Lythgoe, Director of the Food and Drug Division. These regulations were then carefully considered by a committee of 5, — 2 members from this Department, 2 from the baking industry, and 1 representative from a local board of health. After a careful discussion, the regulations that were satisfactory were presented to the Massachusetts Association of Boards of Health and were then presented to the Public Health Council and adopted with only a few minor changes. It was decided to put one inspector upon the bakery work and to go through all the bakeries in the State, working in one locality until all the bakeries in that locality had been inspected.

Before doing this work, however, an inspection form was devised by a conference of local board of health officials with this Department. This form was tried out, found to be defective, and was revised in this Department. Using the new form, all of the bakeries in four cities have been examined. The results of these examinations will be reported to the local boards of health with the request that they call the bakers in to their office for hearings, at which hearings this Department may be represented.

The bakeries inspected are as follows: —

Boston,	8	Malden,	7
Brockton,	41	Springfield,	14
Cambridge,	5	Watertown,	16
Chelsea,	10	Worcester,	6
Framingham,	4		
Lawrence,	57		251
Lowell,	83		

In the manufacture of arsphenamine the Department has been unusually successful. At the beginning of the fiscal year work in the new laboratory had hardly begun. About the middle of December actual production was started and has been kept up during the entire year. A change in the process has been put into practical effect which has cut down the labor in the factory end to such an extent that when one of the laboratory assistants left he was not replaced. A change in the method of ampouling resulted in reducing the amount of labor to such an extent that when two of the female laboratory helpers left, only one additional one was employed.

Mr. Christianson, assistant to Dr. Reid Hunt, has developed a unique change in the process of manufacturing arsphenamine, which process is also advantageous in recovering toxic batches. This process was tried out several times before Mr. Christianson's work was presented for publication, and the results carried out by this Department and tested by Dr. Hunt confirmed the character of the reports submitted to him by his assistant.

We have recovered a number of toxic batches and have sent the product so recovered to certain selected clinics, requesting special reports. These reports indicate that the product is decidedly superior to that made by the old process. The clinical reports in these instances confirm the pharmacological reports. This work was completed at the end of the fiscal year, and it is proposed to change our process of manufacture next year by adopting this new process, which will represent a saving in heat, labor and, to some extent, in the cost of chemicals.

The largest item of expense in the manufacture of arsphenamine is the bottling. In making intermediates and in making the end product, the work can be carried out in large quantities, but the bottling is of necessity applied to individual doses, which must be very carefully weighed, carefully packed in ampoules, and sealed after exhausting the air. It is probable that this cost cannot be reduced below 15 cents per ampoule. At present, however, we are making this article at less than the cost of the commercial article, notwithstanding the relatively small demand for the drug. Many of the commercial houses have a capacity per day equal to our demand per month, which of course would necessarily reduce the cost. It seems feasible, however, that the State should keep on making this article even were the commercial cost to be less than the cost to us, first, because there probably is a trade war being carried on between the commercial houses, and, second, because of the condition of our dye stuff industry. Because of probable German competition, unless appropriate legis-

lation practically prohibiting the importation of German made dyestuffs and medicinals is not passed by Congress before the passage of a peace resolution, the future of the United States dyestuff industry will be subjected to such a severe setback that American dyes and synthetic medicinals will disappear from the market.

TABLE No. 1. — *Milk Statistics by Months.*

MONTH.	Number above Standard.	Number below Standard.	Total Samples collected.	Skimmed Samples marked.	Milk with Cream removed.	Watered Samples.	NUMBER OF SAMPLES WITH SOLIDS VARYING BETWEEN —								
							15 Per Cent and above.	14 and 15 Per Cent.	13 and 14 Per Cent.	12 and 13 Per Cent.	11 and 12 Per Cent.	10 and 11 Per Cent.	9 and 10 Per Cent.	8 and 9 Per Cent.	Below 8 Per Cent.
1919.															
December,	324	46	370	1	7	10	7	7	62	247	41	3	3	–	–
1920.															
January,	217	98	315	2	15	37	3	18	56	140	58	15	23	1	1
February,	233	79	312	–	7	–	4	3	26	199	48	12	14	6	–
March,	806	209	1,015	3	9	48	3	27	150	626	161	25	14	7	2
April,	611	261	872	–	12	56	6	14	100	491	207	38	16	–	–
May,	614	287	901	2	2	87	4	14	94	502	212	51	18	4	2
June,	643	271	914	4	18	44	7	19	118	499	221	35	11	4	–
July,	448	274	722	2	14	86	11	16	113	308	188	59	18	8	1
August,	426	321	747	2	21	43	8	9	53	356	256	40	15	10	–
September,	590	322	912	1	14	87	3	24	99	463	260	31	16	6	10
October,	551	134	685	–	6	22	8	32	130	379	117	11	6	1	1
November,	676	173	849	3	22	62	14	27	131	504	117	40	14	2	–
Totals,	6,139	2,475	8,614	20	145	582	78	210	1,132	4,714	1,886	360	168	49	17

TABLE No. 2. — *Milk Statistics by Months.*

Month.	Average of All Samples.				Average of All Samples not declared skimmed or watered.			
	Number.	Solids (Per Cent).	Fat (Per Cent).	Solids not Fat (Per Cent).	Number.	Solids (Per Cent).	Fat (Per Cent).	Solids not Fat (Per Cent).
1919.								
December,	370	12.62	3.82	8.80	352	12.70	3.87	8.83
1920.								
January,	315	12.30	3.71	8.60	261	12.80	3.94	8.86
February,	312	12.18	3.62	8.56	265	12.58	3.72	8.86
March,	1,015	12.38	3.70	8.68	955	12.51	3.75	8.76
April,	872	12.26	3.66	8.20	804	12.40	3.71	8.69
May,	901	12.17	3.64	8.53	810	12.37	3.70	8.67
June,	914	12.29	3.66	8.63	848	12.45	3.74	8.71
July,	722	12.18	3.73	8.45	620	12.49	3.87	8.62
August,	747	12.06	3.64	8.42	681	12.22	3.73	8.49
September,	912	12.15	3.70	8.45	810	12.53	3.82	8.71
October,	685	12.54	3.87	8.67	657	12.63	3.90	8.73
November,	849	12.40	3.76	8.64	762	12.60	3.86	8.74
Totals,	8,614	12.29	3.71	8.58	7,825	12.49	3.78	8.71

TABLE No. 3. — *Summary of Statistics of Food exclusive of Milk.*

Character of Sample.	Genuine.	Adulterated.	Total.
Butter,	30	6	36
Buttermilk,	3	–	3
Cheese,	1	–	1
Clams,	52	37	89
Cocoa,	1	2	3
Condensed milk,	–	1	1
Confectionery,	–	1	1
Cream,	53	2	55
Dried fruit,	21	24	45
Evaporated milk,	1	–	1
Eggs,	95	193	288
Flavoring extracts,	15	2	17
Flour,	6	–	6
Honey,	1	–	1

TABLE No. 3. — *Summary of Statistics of Food exclusive of Milk* — Concluded.

CHARACTER OF SAMPLE.	Genuine.	Adulterated.	Total.
Ice cream,	29	–	29
Maple sugar,	2	1	3
Miscellaneous,	16	–	16
Molasses,	1	–	1
Nuts,	2	–	2
Olive oil,	95	33	128
Salad dressing,	23	4	27
Sausage,	571	87	658
Shrimp,	4	–	4
Soda water syrup,	1	–	1
Soft drinks,	115	97	212
Spices,	8	–	8
Sugar,	11	2	13
Vinegar,	61	10	71
Totals,	1,218	502	1,720

TABLE No. 4. — *Summary of Drug Statistics.*

CHARACTER OF SAMPLE.	Genuine.	Adulterated.	Total.
Almond oil,	1	–	1
Alcohol,	1	–	1
Camphorated oil,	27	–	27
Citrate magnesium,	9	3	12
Denatured alcohol,	52	1	53
Dobell's solution,	13	–	13
Hamamelis water,	1	–	1
Magnesium sulphate,	1	–	1
Miscellaneous,	5	–	5
Proprietary medicine,	1	–	1
Solution of magnesium citrate,	24	7	31
Spirits of camphor,	14	1	15
Spirits of nitrous ether,	9	6	15
Turpentine,	42	2	44
Totals,	200	20	220

TABLE NO. 5. — *Summary.*

Requests for extension of time granted,		215
Eggs,	6	
Butter,	4	
Game,	2	
Meat,	139	
Fish,	64	
Requests for extension of time not granted,		30
Eggs,	5	
Meat,	4	
Fish,	19	
Condensed milk,	2	
Requests for permission to remove granted,		3
Butter,	2	
Meat,	1	
Articles ordered removed from storage (no requests made),		84
Eggs,	2	
Butter,	4	
Oleomargarine,	5	
Poultry,	12	
Game,	3	
Meat,	35	
Fish,	23	

Requests for Extension of Time granted on Goods in Cold Storage from Dec. 1, 1919, to Dec. 1, 1920.

[Reason for such extension being that goods were in proper condition for further storage.]

ARTICLE.	Weight (Pounds).	Placed in Storage.	Extension granted to —	Name.
Eggs, canned,	120	Aug. 6, 1919	Oct. 1, 1920	Armour & Co.
Eggs, canned,	120	Aug. 6, 1919	Oct. 1, 1920	Armour & Co.
Eggs, canned,	240	Aug. 6, 1919	Oct. 1, 1920	Armour & Co.
Eggs, canned,	1,260	May 23, 1919	June 30, 1920	Goldsmith-Wall-Stockwell Company.
Egg whites,	4,740	Apr. 18, 1919	June 28, 1920	Goldsmith-Wall-Stockwell Company.
Eggs, mixed,	18,360	Apr. 18, 1919	May 18, 1920	Goldsmith-Wall-Stockwell Company.
Butter,	1,900	Aug. 29, 1919	Oct. 29, 1920	Lipsky, Jacob.
Butter,	2,160	Sept. 4, 1919	Dec. 29, 1920	Lipsky, Jacob.
Butter,	1,920	Sept. 11, 1919	Jan. 29, 1921	Lipsky, Jacob.
Butter,	1,140	June 16, 1919	Oct. 1, 1920	Massachusetts Department of Education.
Ducks,	742	Aug. 6, 1919	Oct. 24, 1920	Lawrence, H. L., Company.
Moose,	150	Oct. 10, 1919	Apr. 15, 1921	Brundage, Lawrence F.

Requests for Extension of Time granted on Goods in Cold Storage from Dec. 1, 1919, to Dec. 1, 1920 — Continued.

Article.	Weight (Pounds).	Placed in Storage.	Extension granted to —	Name.
Beef,	16,324	Dec. 13, 1918	Feb. 12, 1920	Dorr, Arthur E., & Co., Inc.
Beef,	15,693	Dec. 14, 1918	Feb. 14, 1920	Dorr, Arthur E., & Co., Inc.
Beef,	14,769	Dec. 18, 1918	Feb. 12, 1920	Dorr, Arthur E., & Co., Inc.
Beef,	15,280	May 3, 1919	June 15, 1920	Horrigan & Doe.
Beef,	4,769	Aug. 9, 1919	Nov. 9, 1920	Libby & Libby Company.
Beef,	11,666	Aug. 12, 1919	Nov. 12, 1920	Libby & Libby Company.
Beef,	4,638	Nov. 26, 1919	Mar. 26, 1921	Strong, Marson Company.
Beef,	33,278	Oct. 10, 1919	Dec. 10, 1920	Swift, E. C., & Co.
Beef,	32,813	Oct. 11, 1919	Dec. 10, 1920	Swilt, E. C., & Co.
Beef briskets,	2,300	Dec. 2, 1918	Feb. 2, 1920	Dorr, Arthur E., & Co., Inc.
Beef briskets,	4,698	Dec. 16, 1918	Feb. 16, 1920	Dorr, Arthur E., & Co., Inc.
Beef chucks,	4,683	Dec. 16, 1918	Feb. 16, 1920	Dorr, Arthur E., & Co., Inc.
Beef loins,	417	Dec. 18, 1918	Feb. 12, 1920	Dorr, Arthur E., & Co., Inc.
Beef shoulders,	23,842	Dec. 12, 1918	Feb. 1, 1920	Handy, H. L., Company.
Beef shoulders,	8,847	Dec. 18, 1918	Feb. 18, 1920	Dorr, Arthur E., & Co., Inc.
Beef strips,	4,560	Nov. 26, 1919	Mar. 26, 1921	Skinner, George E., Company.
Beef tongues,	5,647	Aug. 13, 1919	Nov. 13, 1920	Libby & Libby Company.
Beef trimmings,	1,908	Nov. 21, 1919	Dec. 21, 1920	Fickett, Oscar A., Company.
Beef trimmings,	10,547	July 24, 1919	Aug. 24, 1920	Libby & Libby Company.
Pork,	51,579	Feb. 17, 1919	Apr. 17, 1920	North Packing and Provision Company.
Pork,	52,049	Feb. 17, 1919	Apr. 17, 1920	North Packing and Provision Company.
Pork,	61,162	Feb. 17, 1919	Apr. 17, 1920	North Packing and Provision Company.
Pork,	41,751	Feb. 18, 1919	Apr. 18, 1920	North Packing and Provision Company.
Pork,	43,345	Feb. 18, 1919	Apr. 18, 1920	North Packing and Provision Company.
Pork,	53,181	Feb. 18, 1919	Apr. 18, 1920	North Packing and Provision Company.
Pork,	54,423	Feb. 18, 1919	Apr. 18, 1920	North Packing and Provision Company.
Pork,	59,283	Feb. 18, 1919	Apr. 18, 1920	North Packing and Provision Company.
Pork,	50,075	Feb. 20, 1919	Apr. 20, 1920	North Packing and Provision Company.
Pork,	50,215	Feb. 20, 1919	Apr. 20, 1920	North Packing and Provision Company.
Pork,	50,290	Feb. 20, 1919	Apr. 20, 1920	North Packing and Provision Company.
Pork,	52,792	Feb. 20, 1919	Apr. 20, 1920	North Packing and Provision Company.
Pork,	55,266	Feb. 21, 1919	Apr. 21, 1920	North Packing and Provision Company.
Pork,	55,671	Feb. 21, 1919	Apr. 21, 1920	North Packing and Provision Company.
Pork,	35,501	Mar. 3, 1919	May 3, 1920	North Packing and Provision Company.
Pork,	51,694	Mar. 3, 1919	May 3, 1920	North Packing and Provision Company.

Requests for Extension of Time granted on Goods in Cold Storage from Dec. 1, 1919, to Dec. 1, 1920 — Continued.

Article.	Weight (Pounds).	Placed in Storage.	Extension granted to —	Name.
Pork, ...	55,041	Mar. 3, 1919	May 3, 1920	North Packing and Provision Company.
Pork, ...	53,604	Mar. 5, 1919	May 5, 1920	North Packing and Provision Company.
Pork, ...	47,388	Mar. 6, 1919	May 6, 1920	North Packing and Provision Company.
Pork, ...	54,661	Mar. 6, 1919	May 6, 1920	North Packing and Provision Company.
Pork, ...	55,475	Mar. 7, 1919	May 7, 1920	North Packing and Provision Company.
Pork, ...	51,384	Mar. 8, 1919	May 8, 1920	North Packing and Provision Company.
Pork, ...	22,981	Feb. 1, 1919	May 1, 1920	Springfield Provision Company.
Pork, ...	23,335	Feb. 4, 1919	May 4, 1920	Springfield Provision Company.
Pork, ...	25,133	Feb. 5, 1919	May 5, 1920	Springfield Provision Company.
Pork, ...	25,209	Feb. 6, 1919	May 6, 1920	Springfield Provision Company.
Pork, ...	25,704	Feb. 7, 1919	May 7, 1920	Springfield Provision Company.
Pork, ...	12,999	Feb. 8, 1919	May 8, 1920	Springfield Provision Company.
Pork, ...	21,891	Feb. 10, 1919	May 10, 1920	Springfield Provision Company.
Pork, ...	15,494	Feb. 12, 1919	May 12, 1920	Springfield Provision Company.
Pork, ...	13,933	Feb. 13, 1919	May 13, 1920	Springfield Provision Company.
Pork, ...	16,881	Feb. 14, 1919	May 14, 1920	Springfield Provision Company.
Pork, ...	14,830	Feb. 15, 1919	May 15, 1920	Springfield Provision Company.
Pork, ...	15,364	Feb. 19, 1919	May 19, 1920	Springfield Provision Company.
Pork, ...	19,959	Feb. 20, 1919	May 20, 1920	Springfield Provision Company.
Pork, ...	16,505	Feb. 21, 1919	May 21, 1920	Springfield Provision Company.
Pork, ...	14,645	Feb. 24, 1919	May 24, 1920	Springfield Provision Company.
Pork, ...	21,876	Feb. 25, 1919	May 25, 1920	Springfield Provision Company.
Pork, ...	8,803	Feb. 26, 1919	May 26, 1920	Springfield Provision Company.
Pork, ...	46,320	Jan. 18, 1919	Mar. 18, 1920	Squire, John P., & Co.
Pork, ...	46,372	Jan. 18, 1919	Mar. 18, 1920	Squire, John P., & Co.
Pork, ...	52,600	Jan. 20, 1919	Mar. 20, 1920	Squire, John P., & Co.
Pork, ...	45,910	Jan. 21, 1919	Mar. 21, 1920	Squire, John P., & Co.
Pork, ...	52,438	Jan. 21, 1919	Mar. 21, 1920	Squire, John P., & Co.
Pork, ...	52,771	Jan. 21, 1919	Mar. 21, 1920	Squire, John P., & Co.
Pork, ...	59,400	Jan. 21, 1919	Mar. 21, 1920	Squire, John P., & Co.
Pork, ...	42,622	Jan. 22, 1919	Mar. 22, 1920	Squire, John P., & Co.
Pork, ...	42,630	Jan. 23, 1919	Mar. 23, 1920	Squire, John P., & Co.
Pork, ...	56,098	Jan. 23, 1919	Mar. 23, 1920	Squire, John P., & Co.
Pork, ...	45,584	Jan. 24, 1919	Mar. 24, 1920	Squire, John P., & Co.
Pork, ...	55,620	Jan. 24, 1919	Mar. 24, 1920	Squire, John P., & Co.
Pork, ...	59,980	Jan. 24, 1919	Mar. 24, 1920	Squire, John P., & Co.

Requests for Extension of Time granted on Goods in Cold Storage from Dec. 1, 1919, to Dec. 1, 1920 — Continued.

Article.	Weight (Pounds).	Placed in Storage.	Extension granted to —	Name.
Pork, ...	48,186	Jan. 25, 1919	Mar. 25, 1920	Squire, John P., & Co.
Pork, ...	54,722	Jan. 25, 1919	Mar. 25, 1920	Squire, John P., & Co.
Pork, ...	55,453	Jan. 27, 1919	Mar. 27, 1920	Squire, John P., & Co.
Pork, ...	61,900	Jan. 28, 1919	Mar. 28, 1920	Squire, John P., & Co.
Pork, ...	45,150	Jan. 29, 1919	Mar. 29, 1920	Squire, John P., & Co.
Pork, ...	47,088	Jan. 29, 1919	Mar. 29, 1920	Squire, John P., & Co.
Pork, ...	51,605	Jan. 29, 1919	Mar. 29, 1920	Squire, John P., & Co.
Pork, ...	52,062	Jan. 29, 1919	Mar. 29, 1920	Squire, John P., & Co.
Pork, ...	53,103	Jan. 29, 1919	Mar. 29, 1920	Squire, John P., & Co.
Pork, ...	54,865	Jan. 30, 1919	Mar. 30, 1920	Squire, John P., & Co.
Pork, ...	55,210	Jan. 30, 1919	Mar. 30, 1920	Squire, John P., & Co.
Pork, ...	40,060	Jan. 31, 1919	Mar. 31, 1920	Squire, John P., & Co.
Pork, ...	47,329	Jan. 31, 1919	Mar. 31, 1920	Squire, John P., & Co.
Pork, ...	48,720	Jan. 31, 1919	Mar. 31, 1920	Squire, John P., & Co.
Pork, ...	53,573	Jan. 31, 1919	Mar. 31, 1920	Squire, John P., & Co.
Pork, ...	38,880	Feb. 1, 1919	Apr. 1, 1920	Squire, John P., & Co.
Pork, ...	49,909	Feb. 1, 1919	Apr. 1, 1920	Squire, John P., & Co.
Pork, ...	51,910	Feb. 1, 1919	Apr. 1, 1920	Squire, John P., & Co.
Pork, ...	53,608	Feb. 1, 1919	Apr. 1, 1920	Squire, John P., & Co.
Pork, ...	58,610	Feb. 1, 1919	Apr. 1, 1920	Squire, John P., & Co.
Pork, ...	45,840	Feb. 3, 1919	Apr. 1, 1920	Squire, John P., & Co.
Pork, ...	45,889	Feb. 3, 1919	Apr. 3, 1920	Squire, John P., & Co.
Pork, ...	52,739	Feb. 3, 1919	Apr. 3, 1920	Squire, John P., & Co.
Pork, ...	52,912	Feb. 3, 1919	Apr. 3, 1920	Squire, John P., & Co.
Pork, ...	48,787	Feb. 4, 1919	Apr. 4, 1920	Squire, John P., & Co.
Pork, ...	53,236	Feb. 4, 1919	Apr. 4, 1920	Squire, John P., & Co.
Pork, ...	53,579	Feb. 4, 1919	Apr. 4, 1920	Squire, John P., & Co.
Pork, ...	45,337	Feb. 6, 1919	Apr. 6, 1920	Squire, John P., & Co.
Pork, ...	47,000	Feb. 6, 1919	Apr. 6, 1920	Squire, John P., & Co.
Pork, ...	52,638	Feb. 6, 1919	Apr. 6, 1920	Squire, John P., & Co.
Pork, ...	54,604	Feb. 6, 1919	Apr. 6, 1920	Squire, John P., & Co.
Pork, ...	58,165	Feb. 6, 1919	Apr. 6, 1920	Squire, John P., & Co.
Pork, ...	43,184	Feb. 7, 1919	Apr. 7, 1920	Squire, John P., & Co.
Pork, ...	65,423	Feb. 7, 1919	Apr. 7, 1920	Squire, John P., & Co.
Pork, ...	52,452	Feb. 8, 1919	Apr. 8, 1920	Squire, John P., & Co.
Pork, ...	55,160	Feb. 10, 1919	Apr. 10, 1920	Squire, John P., & Co.

Requests for Extension of Time granted on Goods in Cold Storage from Dec. 1, 1919, to Dec. 1, 1920 — Continued.

Article.	Weight (Pounds).	Placed in Storage.	Extension granted to —	Name.
Pork, ...	40,470	Feb. 11, 1919	Apr. 11, 1920	Squire, John P., & Co.
Pork, ...	54,295	Feb. 11, 1919	Apr. 11, 1920	Squire, John P., & Co.
Pork, ...	58,800	Feb. 11, 1919	Apr. 11, 1920	Squire, John P., & Co.
Pork, ...	59,623	Feb. 11, 1919	Apr. 11, 1920	Squire, John P., & Co.
Pork, ...	49,500	Feb. 14, 1919	Apr. 14, 1920	Squire, John P., & Co.
Pork, ...	47,118	Feb. 15, 1919	Apr. 15, 1920	Squire, John P., & Co.
Pork, ...	48,824	Feb. 15, 1919	Apr. 15, 1920	Squire, John P., & Co.
Pork, ...	44,981	Feb. 17, 1919	Apr. 17, 1920	Squire, John P., & Co.
Pork, ...	51,579	Feb. 17, 1919	Apr. 17, 1920	Squire, John P., & Co.
Pork, ...	52,800	Feb. 17, 1919	Apr. 17, 1920	Squire, John P., & Co.
Pork, ...	37,556	Feb. 21, 1919	Apr. 21, 1920	Squire, John P., & Co.
Pork, ...	52,382	Feb. 21, 1919	Apr. 21, 1920	Squire, John P., & Co.
Pork, ...	54,075	Feb. 21, 1919	Apr. 21, 1920	Squire, John P., & Co.
Pork, ...	45,270	Mar. 14, 1919	May 14, 1920	Squire, John P., & Co.
Pork, ...	41,608	Mar. 15, 1919	May 15, 1920	Squire, John P., & Co.
Pork, ...	46,410	Mar. 18, 1919	May 18, 1920	Squire, John P., & Co.
Pork, ...	51,050	Mar. 18, 1919	May 18, 1920	Squire, John P., & Co.
Pork, ...	42,812	Mar. 19, 1919	May 19, 1920	Squire, John P., & Co.
Pork, ...	47,310	Mar. 19, 1919	May 19, 1920	Squire, John P., & Co.
Pork, ...	48,085	Mar. 21, 1919	May 21, 1920	Squire, John P., & Co.
Pork, ...	48,970	Mar. 21, 1919	May 21, 1920	Squire, John P., & Co.
Pork, ...	55,639	Mar. 22, 1919	May 22, 1920	Squire, John P., & Co.
Pork, ...	45,340	Mar. 25, 1919	May 25, 1920	Squire, John P., & Co.
Pork, ...	46,959	Mar. 25, 1919	May 25, 1920	Squire, John P., & Co.
Pork, ...	50,400	Mar. 29, 1919	May 29, 1920	Squire, John P., & Co.
Pork, ...	51,600	Mar. 31, 1919	May 31, 1920	Squire, John P., & Co.
Pork, ...	51,170	Apr. 1, 1919	June 1, 1920	Squire, John P., & Co.
Pork, ...	52,345	Apr. 1, 1919	June 1, 1920	Squire, John P., & Co.
Pork, ...	52,510	Apr. 3, 1919	June 3, 1920	Squire, John P., & Co.
Pork, ...	54,015	Apr. 7, 1919	June 7, 1920	Squire, John P., & Co.
Pork, ...	30,350	Apr. 10, 1919	June 10, 1920	Squire, John P., & Co.
Pork, ...	33,170	Apr. 10, 1919	June 10, 1920	Squire, John P., & Co.
Bonita, ...	1,050	Oct. 8, 1919	Dec. 8, 1920	Tocco, Joseph.
Cod, ...	2,420	Nov. 24, 1919	Jan. 24, 1921	O'Brien, R., & Co.
Eels, sand, . . .	–	Aug. 5, 1919	Dec. 5, 1920	Busalacchi Brothers.
Eels, sand, . . .	455	Oct. 10, 1919	Dec. 10, 1920	Tocco, Joseph.

Requests for Extension of Time granted on Goods in Cold Storage from Dec. 1, 1919, to Dec. 1, 1920 — Continued.

Article.	Weight (Pounds).	Placed in Storage.	Extension granted to —	Name.
Flounders,	1,500	Aug. 10, 1919	May 20, 1920	Newburyport Fisheries Company.
Haddock,	1,330	Sept. 30, 1919	Oct. 30, 1920	Atlantic & Pacific Fish Company.
Haddock scrod,	5,000	Aug. 15, 1919	Dec. 31, 1920	Whitman, Ward & Lee Company.
Herring,	21,290	Apr. 10, 1919	Oct. 9, 1920	Atwood & Co.
Herring,	28,700	Apr. 10, 1919	Oct. 10, 1920	Atwood & Co.
Herring,[1]	21,600	Jan. 9, 1919	Apr. 1, 1920	Bay State Fishing Company.
Herring,[1]	4,300	Jan. 24, 1919	Apr. 1, 1920	Bay State Fishing Company.
Herring,[1]	9,000	Feb. 17, 1919	May 1, 1920	Bay State Fishing Company.
Herring,[1]	2,000	May 3, 1918	Apr. 1, 1920	Bay State Fishing Company.
Herring,[1]	1,800	June 10, 1918	Apr. 1, 1920	Bay State Fishing Company.
Herring,	8,400	June 4, 1919	Oct. 1, 1920	Bay State Fishing Company.
Herring,	5,425	Sept. 23, 1919	Nov. 23, 1920	Bay State Fishing Company.
Herring,	3,700	Sept. 24, 1919	Nov. 24, 1920	Bay State Fishing Company.
Herring,	6,800	Oct. 11, 1919	Feb. 11, 1921	Busalacchi Brothers.
Herring,	2,600	Oct. 23, 1919	Feb. 11, 1921	Busalacchi Brothers.
Herring,	3,200	Oct. 23, 1919	Feb. 11, 1921	Busalacchi Brothers.
Herring,	2,500	Nov. 14, 1919	Feb. 11, 1921	Busalacchi Brothers.
Herring,	1,140	Sept. 25, 1919	Jan. 30, 1921	Cefalu, Joseph.
Herring,	1,280	Sept. 30, 1919	Jan. 30, 1921	Cefalu, Joseph.
Herring,	2,940	Oct. 16, 1919	Jan. 30, 1921	Cefalu, Joseph.
Herring,	5,600	– –	July 5, 1920	Chatham Freezer Company.
Herring,[1]	1,800	Nov. 3, 1919	Dec. 26, 1920	Chatham Freezer Company.
Herring,[1]	37,600	Nov. 23, 1919	Dec. 26, 1920	Chatham Freezer Company.
Herring,[1]	24,300	Mar. 6, 1919	May 6, 1920	Nagle, John, Company.
Herring,[1]	40,000	Mar. 6, 1919	May 6, 1920	Nagle, John, Company.
Herring,	4,000	Aug., 1919	May 20, 1920	Newburyport Fisheries Company.
Herring,	3,000	Oct. 20, 1919	Mar. 1, 1921	Phillips, B. F., & Co.
Herring,	925	Nov. 18, 1919	Mar. 1, 1921	Phillips, B. F., & Co.
Herring,	770	Sept. 29, 1919	Dec. 29, 1920	Tocco, Joseph.
Herring, sardine,	1,750	Sept. 24, 1919	Jan. 30, 1921	Cefalu, Joseph.
Herring, sardine,	175	Sept. 30, 1919	Jan. 30, 1921	Cefalu, Joseph.
Herring, sardine,	560	Oct. 17, 1919	Jan. 30, 1921	Cefalu, Joseph.
Herring, sardine,	630	Oct. 24, 1919	Jan. 30, 1921	Cefalu, Joseph.
Herring, sardine,	245	Oct. 20, 1919	Jan. 30, 1921	Cefalu, Joseph.
Herring, sardine,	780	Oct. 29, 1919	Jan. 30, 1921	Cefalu, Joseph.
Herring, sardine,	2,200	Oct. 22, 1919	Dec. 22, 1920	Mantia, John, Sons.

[1] Bait.

Requests for Extension of Time granted on Goods in Cold Storage from Dec. 1, 1919, to Dec. 1, 1920 — Concluded.

Article.	Weight (Pounds).	Placed in Storage.	Extension granted to —	Name.
Herring, sardine,	5,000	Nov. 25, 1919	Jan. 25, 1921	Russo & Sons.
Herring, sardine,	1,155	Oct. 2, 1919	Dec. 2, 1920	Tocco, Joseph.
Herring, sardine,	3,150	Oct. 31, 1919	Dec. 31, 1920	Tocco, Joseph.
Pollock,	6,414	Dec. 9, 1919	Feb. 9, 1921	Dahlman, John A.
Salmon,	400	Nov. 3, 1919	Feb. 3, 1921	Busalacchi Brothers.
Shark,	640	July 15, 1919	Nov. 15, 1920	Globe Fish Company.
Skatefish,	1,750	Nov. 13, 1919	Jan. 13, 1921	Russo & Sons.
Skate wings,	175	Aug. 13, 1919	Dec. 13, 1920	Globe Fish Company.
Skate wings,	1,155	Oct. 28, 1919	Dec. 28, 1920	Tocco, Joseph.
Whiting,	140	Oct. 4, 1919	Jan. 30, 1921	Cefalu, Joseph.
Whiting,	7,500	Nov., 1919	Feb. 1, 1921	Consolidated Weir Company.
Whiting,	42,500	Nov., 1919	Feb. 1, 1921	Consolidated Weir Company.
Whiting,	1,500	Nov. 3, 1919	Feb. 3, 1921	Consolidated Weir Company.
Whiting,	805	Aug. 13, 1919	Dec. 13, 1920	Globe Fish Company.
Whiting,	630	Aug. 18, 1919	Dec. 18, 1920	Globe Fish Company.
Whiting,	6,640	July 2, 1919	Dec. 31, 1920	Mantia, Salvatore.
Whiting,	2,880	July 18, 1919	Dec. 31, 1920	Mantia, Salvatore.
Whiting,	175	Sept. 4, 1919	Dec. 4, 1920	Tocco, Joseph.
Whiting,	560	Sept. 11, 1919	Dec. 11, 1920	Tocco, Joseph.
Whiting,	1,120	Sept. 12, 1919	Dec. 12, 1920	Tocco, Joseph.
Whiting,	350	Sept. 25, 1919	Dec. 25, 1920	Tocco, Joseph.
Whiting,	280	Oct. 3, 1919	Dec. 3, 1920	Tocco, Joseph.
Whiting,	455	Oct. 10, 1919	Dec. 10, 1920	Tocco, Joseph.
Whiting,	140	Oct. 25, 1919	Dec. 25, 1920	Tocco, Joseph.

Requests for Extension of Time not granted on Goods in Cold Storage from Dec. 1, 1919, to Dec. 1, 1920.

Article.	Weight (Pounds).	Placed in Storage.	Name.
Eggs, canned,	1,020	May 6, 1919	Goldsmith-Wall-Stockwell Company.
Eggs, canned,	1,340	May 8, 1919	Goldsmith-Wall-Stockwell Company.
Eggs, canned,	1,220	May 10, 1919	Goldsmith-Wall-Stockwell Company.
Eggs, canned,	1,460	May 13, 1919	Goldsmith-Wall-Stockwell Company.
Egg whites,	180	Mar. 4, 1919[1]	Rausch, Robert, & Son.

[1] Previously stored in the West.

Requests for Extension of Time not granted on Goods in Cold Storage from Dec. 1, 1919, to Dec. 1, 1920 — Concluded.

Article.	Weight (Pounds).	Placed in Storage.	Name.
Beef,	4,689	Jan. 4, 1919	Boston Beef Company.
Beef,	8,402	Jan. 31, 1919	Boston Beef Company.
Beef rumps and rounds,	3,700	Jan. 24, 1919	Demary, A. C.
Ox joints,	810	Sept. 2, 1918	Wentworth Lunch Company.
Halibut,	3,750	Jan. 4, 1919	Boston Fish Pier Company.
Halibut,	4,431	Jan. 14, 1919	Boston Fish Pier Company.
Halibut,	375	Jan. 15, 1919	Boston Fish Pier Company.
Halibut,	5,018	Jan. 15, 1919	Boston Fish Pier Company.
Halibut,	5,094	Jan. 17, 1919	Boston Fish Pier Company.
Halibut,	7,620	Jan. 17, 1919	Boston Fish Pier Company.
Halibut,	55,011	Jan. 20, 1919	Boston Fish Pier Company.
Halibut,	5,122	Jan. 20, 1919	Boston Fish Pier Company.
Halibut,	5,220	Jan. 20, 1919	Boston Fish Pier Company.
Halibut,	7,118	Jan. 20, 1919	Boston Fish Pier Company.
Halibut,	4,099	Jan. 22, 1919	Boston Fish Pier Company.
Halibut,	7,620	Jan. 22, 1919	Boston Fish Pier Company.
Halibut,	1,074	Dec. 11, 1918	Fulham & Herbert.
Halibut,	5,165	Dec. 27, 1918	New England Fish Company.
Herring,	2,200	Jan. 21, 1919	O'Brien, R., & Co.
Salmon,	7,760	Jan. 15, 1919	Boston Fish Pier Company.
Shad,	10,598	Jan. 22, 1919	New England Fish Company.
Shad,	6,262	Jan. 25, 1919	New England Fish Company.
Shad,	12,616	Jan. 25, 1919	New England Fish Company.
Condensed milk,	56[1]	July 2, 1919	Hood, H. P., & Sons.
Condensed milk,	29[1]	July 19, 1919	Hood, H. P., & Sons.

[2] Cans.

Requests granted for Permission to remove Articles which had been in Cold Storage longer than Twelve Months, from Dec. 1, 1919, to Dec. 1, 1920.

Article.	Weight (Pounds).	Placed in Storage.	Name.
Butter,	–	– –	Lewis, Mears Company.
Butter,	1,200	May 20, 1919	Lowney, The Walter M., Company.
Beef,	50	June 16, 1919	Souza, John.

Articles which had been in Cold Storage longer than Twelve Months, and on which No Requests for Extension had been made, ordered removed, from Dec. 1, 1919, to Dec. 1, 1920.

Article.	Weight (Pounds).	Placed in Storage.	Name.
Eggs, canned,	64[1]	Dec. 27, 1918	Layton, John, Company.
Egg yolks, canned,	30	Apr. 18, 1919	Goldsmith-Wall-Stockwell Company.
Butter,	–	July 3, 1919	Apollo Lunch.
Butter,	5,200	Sept. 30, 1919	Armour & Co.
Butter,	305	June 18, 1919	Dube Brothers.
Butter,	1,575	July 10, 1919	Security Trust Company.
Oleomargarine,	1,505	Oct. 22, 1919	Cushman, H. G.
Oleomargarine,	506	May 19, 1919	Kellogg Products Inc.
Oleomargarine,	450	July 18, 1919	Kellogg Products Inc.
Oleomargarine,	720	Sept. 22, 1919	Kellogg Products Inc.
Oleomargarine,	380	Nov. 6, 1919	Kellogg Products Inc.
Chickens,	217	Dec. 27, 1919	Levin, A. P.
Chickens,	579	Oct. 21, 1919	Porter, C. H.
Fowl,	408	Dec. 27, 1918	Levin, A. P.
Poultry,	–	Dec. 16, 1918	Brigham's Restaurant.
Poultry,	–	Nov. 29, 1919	Cohen, Samuel.
Poultry,	160	Feb. 1, 1919	Pratt, F. B., Company.
Poultry,	–	Oct. 22, 1918	Shearer, C. T., Company.
Poultry,	–	Feb. 12, 1919	Shearer, C. T., Company.
Poultry,	–	Oct. 22, 1918	Warren Hotel.
Turkeys,	230	Dec. 23, 1918	Blackstone Supply Company.
Turkeys,	247	Dec. 27, 1918	Levin, A. P.
Turkeys,	220	Jan. 2, 1919	Robbins, Nathan, Company.
Rabbits,	360	Feb. 4, 1919	McCabe, M. J., Company.
Venison,	15	Nov. 14, 1918	Finnegan, R. E.
Game, miscellaneous,	15	Feb. 8, 1919	Mixter, Dr. S. J.
Beef,	23,957	Nov. 7, 1919	Handy, H. L., Company.
Beef,	5,195	May 29, 1919	Libby & Libby Company.
Beef,	434	June 10, 1919	Libby & Libby Company.
Beef,	17,949	June 13, 1919	Libby & Libby Company.
Beef,	876	June 24, 1919	Libby & Libby Company.
Beef,	1,276	June 25, 1919	Libby & Libby Company.
Beef,	2,323	Dec. 11, 1918	Lipsky, Samuel.
Beef,	2,602	Dec. 18, 1919	Lipsky, Samuel.
Beef,	–	– –	Shearer, C. T., Company.

[1] Cans.

Articles which had been in Cold Storage longer than Twelve Months, and on which No Requests for Extension had been made, ordered removed, from Dec. 1, 1919, to Dec. 1, 1920 — Continued.

Article.	Weight (Pounds).	Placed in Storage.	Name.
Beef briskets,	5,739	May 20, 1919	Libby & Libby Company.
Beef briskets,	6,359	May 22, 1919	Libby & Libby Company.
Beef briskets,	7,025	May 23, 1919	Libby & Libby Company.
Beef briskets,	4,617	June 2, 1919	Libby & Libby Company.
Beef flanks,	758	May 29, 1919	Libby & Libby Company.
Beef flanks,	2,803	June 20, 1919	Libby & Libby Company.
Beef flanks,	697	June 27, 1919	Libby & Libby Company.
Beef flanks,	469	July 1, 1919	Libby & Libby Company.
Beef cheek meat,	400	Jan. 21, 1919	Mindick, M.
Beef fores,	4,295	Sept. 17, 1919	Swift & Co.
Beef kidneys,	80	Apr. 26, 1919	Portsmouth Market.
Beef kidneys,	450	Apr. 26, 1919	Portsmouth Market.
Beef livers,	777	Dec. 30, 1918	Cohen, Nathan.
Beef rounds,	6,461	June 6, 1919	Libby & Libby Company.
Beef rounds,	1,538	Jan. 6, 1919	Lipsky, Samuel.
Beef rumps and rounds,	2,726	Apr. 24, 1919	Libby & Libby Company.
Beef stickers,	2,565	Nov. 14, 1918	Lipsky, Samuel.
Beef stickers,	2,948	Nov. 19, 1918	Lipsky, Samuel.
Calves' livers,	300	1918–1919	Royal Market Company.
Hogs' kidneys,	700	Mar. 14, 1919	Moore, Alexander.
Lamb,	716	Sept. 19, 1919	Goulakis, A.
Ox joints,	625	Sept. 2, 1918	Boylston Café.
Ox joints,	625	Sept. 2, 1918	Dorr, Arthur E., & Co., Inc.
Pork kidneys,	249	Sept. 18, 1919	Goulakis, A.
Sweetbreads,	90	June 6, 1919	Batchelder & Snyder Company.
Veal kidneys,	118	Nov. 30, 1918	Standard Beef Company.
Eels, sand,	35	Oct. 15, 1919	Busalacchi, Tony, & Co.
Haddock,	500	July 3, 1919	Foilb, M.
Herring,	400	Oct. 2, 1919	Busalacchi Brothers.
Herring, sardine,	175	Oct. 9, 1919	Globe Fish Company.
Herring, sardine,	175	Aug. 11, 1919	Mantia, S., & Co.
Lobster meat,	20	Apr. 22, 1919	Grilli, I.
Mackerel,	1,750	Dec. 21, 1918	Globe Fish Company.
Mackerel,	140	Apr. 24, 1919	Hellenic Fish Market.
Mackerel,	2,650	June 11, 1919	Mashecco, M.

Articles which had been in Cold Storage longer than Twelve Months, and on which No Requests for Extension had been made, ordered removed, from Dec. 1, 1919, to Dec. 1, 1920 — Concluded.

Article.	Weight (Pounds).	Placed in Storage.	Name.
Monkey fish,	280	Aug. 23, 1919	Mantia, S., & Co.
Salmon,	200	July 5, 1919	Coleman Sons Company.
Shark,	460	July 3, 1919	Globe Fish Company.
Shark,	640	July 15, 1919	Globe Fish Company.
Shark,	85	Oct. 11, 1919	Reynolds' Market.
Shark,	192	Aug. 30, 1919	Russo & Sons.
Skates,	–	July 23, 1919	Globe Fish Company.
Skates,	–	July 17, 1919	Mantia, S., & Co.
Skate wings,	1,505	Oct. 22, 1919	Russo & Sons.
Whiting,	–	July 17, 1919	Corso & Cannizzo.
Whiting,	100	June 27, 1919	Globe Fish Company.
Whiting,	1,295	Aug. 11, 1919	Mantia, S., & Co.
Whiting,	3,710	Sept. 8, 1919	Mantia, S., & Co.
Whiting,	1,805	Sept. 12, 1919	Mantia, S., & Co.

Articles placed in Cold Storage from Dec. 1, 1919, to Dec. 1, 1920.

Articles placed in Cold Storage.	December, 1919.	January, 1920.	February, 1920.	March, 1920.	April, 1920.	May, 1920.	June, 1920.	July,[1] 1920.	August,[1] 1920.	September,[1] 1920.	October,[1] 1920.	November,[1] 1920.	Totals.
Eggs, case (dozens),	143,820	142,860	265,350	202,680	2,670,300	10,391,400	4,505,775	1,146,990	639,300	556,950	446,970	191,460	21,303,855
Eggs, broken-out (pounds),	165,177	206,866	112,815	242,572	143,693	251,692	324,911	230,558	539,108	369,735	88,176	293,719	2,969,022
Butter (pounds),	769,663	620,866	331,897	1,853,460	673,656	691,034	7,676,869	10,340,914	5,946,218	3,445,141	2,195,115	854,308	35,399,141
Poultry (pounds),	4,521,534	2,399,376½	652,862	711,836	450,058	1,007,553	960,355	1,122,721	654,075	680,281	1,372,818	1,492,275	16,025,744½
Game (pounds),	42,610	14,986	2,610	693	873	994	101	–	–	–	–	–	62,867
Meat, fresh, and meat products, fresh (pounds),	8,112,321	8,905,154½	9,599,909	9,992,364	4,750,990	7,883,783	6,233,845	8,028,240	5,061,882	5,968,825	9,315,281	3,888,765	87,741,359½
Fish, fresh food (pounds),	1,274,126	1,631,170	723,442	1,554,124	664,014	1,120,554	4,511,285	5,388,511	5,772,265	2,858,492	2,968,619	2,745,994	31,212,596
Totals,[2]	15,029,251	13,921,279	11,688,885	14,557,729	9,353,584	21,347,010	24,213,141	26,257,934	18,612,848	13,879,424	16,386,979	9,466,521	194,714,585

[1] A new form of cold-storage report has been devised on which the game is not reported.

[2] Inasmuch as the contents of one dozen eggs averages 1 pound, the dozens of eggs are added as pounds.

Articles held in Cold Storage from Jan. 1, 1920, through Dec. 1, 1920.

	Jan. 1, 1920.	Feb. 1, 1920.	March 1, 1920.	April 1, 1920.	May 1, 1920.	June 1, 1920.	July 1, 1920.	Aug. 1,[1] 1920.	Sept. 1,[1] 1920.	Oct. 1,[1] 1920.	Nov. 1,[1] 1920.	Dec. 1,[1] 1920.
Eggs, case (dozens),	4,743,880	1,291,792	28,020	68,610	2,645,250	12,857,340	16,874,705	16,760,820	15,445,830	11,813,130	9,786,960	5,660,070
Eggs, broken out (pounds),	440,164	463,334	418,249	380,317	294,752	368,413	510,045	525,975	844,107	893,270	613,746	558,060
Butter (pounds),	8,740,794	5,554,659	2,063,133	1,544,754	270,912	620,747	7,132,110	16,051,730	19,655,259	19,742,554	19,174,779	14,950,423
Poultry (pounds),	–	–	–	–	–	–	–	2,238,948	1,492,430	1,199,907	1,842,430	2,751,657
Meat, fresh, and meat products, fresh (pounds),	–	–	–	–	–	–	–	31,552,029	31,018,956	21,005,734	24,865,856	24,759,277
Fish, fresh food (pounds),	–	–	–	–	–	–	–	15,634,309	18,898,855	17,926,195	20,677,145	16,312,775
Totals,[2]	13,924,838	7,309,785	2,509,402	1,993,681	3,210,914	13,846,500	24,516,860	82,763,811	87,355,437	72,580,790	76,960,916	64,992,262

[1] A new form of cold-storage report was devised upon which, on and after August 1, all articles on hand are reported.

[2] Inasmuch as the contents of one dozen eggs averages 1 pound, the dozens of eggs are added as pounds.

TABLE No. 6. — *List of Prosecutions.*

For Sale of Milk not of Good Standard Quality.

NAME.	Address.	Court.	Date.	Result.
Baracos, Charles,	Winthrop,	East Boston,	Aug. 17, 1920	Conviction.
Braun, Joseph,	Springfield,	Springfield,	Dec. 16, 1919	Conviction.
Caevallu, Joseph A.,	Fall River,	Fall River,	Oct. 5, 1920	Conviction.
Caro, Samuel,	Springfield,	Springfield,	Nov. 16, 1920	Conviction.
Cohen, Jacob,	Winthrop,	East Boston,	Aug. 9, 1920	Conviction.
Creamer, Oscar,	Springfield,	Springfield,	Nov. 24, 1920	Conviction.
Donovan, James,	Salisbury,	Newburyport,	Sept. 1, 1920	Conviction.
Economidy, Anthony,	Springfield,	Springfield,	Nov. 16, 1920	Conviction.
Gordon, James D.,	Salem,	Salem,	Aug. 6, 1920	Conviction.
Johnson, Charles,	Hull,	Hingham,	Sept. 3, 1920	Conviction.
Karelis, Dennis,	Hingham,	Hingham,	Aug. 10, 1920	Conviction.
Karelis, Dennis,	Hingham,	Hingham,	Aug. 10, 1920	Conviction.
Koury, Maroun,	Hull,	Hingham,	Sept. 3, 1920	Conviction.
Lampros, Samuel,	Springfield,	Springfield,	Nov. 16, 1920	Conviction.
Litchfield, Wm. F.,	Edgartown,	Oak Bluffs,	Oct. 21, 1920	Conviction.
Mahamad, Kaya,	Hingham,	Hingham,	Aug. 10, 1920	Discharged.
McCarthy, Samuel J.,	Springfield,	Springfield,	Dec. 16, 1919	Conviction.
Mellar, Stephen,	Springfield,	Springfield,	Nov. 16, 1920	Conviction.
Norton, Clement,	Edgartown,	Oak Bluffs,	Oct. 21, 1920	Conviction.
Peterson, Robert,	Hingham,	Hingham,	Aug. 10, 1920	Conviction.
Sing, Mah,	Salem,	Salem,	Aug. 6, 1920	Conviction.
Union News Co.,	Fall River,	Fall River,	Mar. 30, 1920	Conviction.
Ying, Moy,	Springfield,	Springfield,	Jan. 6, 1920	Conviction.
Young, Constantine,	Hingham,	Hingham,	Aug. 10, 1920	Conviction.

For Sale of Milk from which a Portion of the Cream had been removed.

Buckley, Charles V.,	Monson,	Palmer,	Sept. 30, 1920	Conviction.[1]
Graustein, Wm. A.,	Cambridge,	Waltham,	Jan. 7, 1920	Conviction.[2]
Johnson, Bradford S.,	Gardner,	Gardner,	Nov. 12, 1920	Conviction.
Kicopoulos, Nicholas,	Monson,	Palmer,	Sept. 30, 1920	Conviction.[1]
Moregeau, William,	Attleboro,	Attleboro,	July 23, 1920	Conviction.
Nobut, Peter,	West Medway,	Franklin,	Oct. 9, 1920	Conviction.

[1] Continued to Dec. 30, 1920, for sentence. [2] Appealed; nol-prossed in Superior Court.

For Sale of Milk containing Added Water.

Name.	Address.	Court.	Date.	Result.
Almedia, Joseph,	Westport,	Fall River,	May 21, 1920	Conviction.
Arruda, Joseph J.,	Fall River,	Fall River,	Oct. 5, 1920	Conviction.
Asadoorian, Hagop,	North Andover,	Andover,	Nov. 16, 1920	Conviction.
Asoian, Nishan,	Andover,	Andover,	Nov. 16, 1920	Conviction.
Bacon, William H.,	Lexington,	Concord,	Oct. 11, 1920	Conviction.
Baker, D. Frank,	Swansea,	Fall River,	Aug. 31, 1920	Conviction.[1]
Baker, Henry A.,	Rockland,	Abington,	Apr. 21, 1920	Dismissed.
Barberian, Dan,	Andover,	Lawrence,	Apr. 12, 1920	Conviction.
Barbieri, Andrew,	Great Barrington,	Great Barrington,	Dec. 16, 1919	Conviction.[1]
Bennett, Matthew J.,	Burlington,	Woburn,	Nov. 8, 1920	Conviction.
Billings, Lawson H.,	Plympton,	Plymouth,	May 11, 1920	Conviction.
Billings, Lewis E.,	Plympton,	Plymouth,	May 11, 1920	Conviction.
Boissoneau, Alfred,	Tiverton, R. I.,	Fall River,	Nov. 9, 1920	Conviction.[1]
Bonnette, Theodore J.,	Southbridge,	Southbridge,	Apr. 23, 1920	Nol-prossed.[2]
Bookless, Samuel,	Pittsfield,	Pittsfield,	Dec. 17, 1919	Conviction.
Bouchard, William,	Westport,	Fall River,	Aug. 10, 1920	Conviction.
Bury, Charles,	Taunton,	Taunton,	June 10, 1920	Conviction.[1]
Cassidy, Frank,	Medway,	Franklin,	Aug. 28, 1920	Conviction.
Charonitch, Alexander,	Medway,	Franklin,	May 18, 1920	Conviction.
Collins, John L.,	Woburn,	Woburn,	Nov. 5, 1920	Conviction.
Corbin, John,	Millbury,	Worcester,	June 28, 1920	Conviction.
Correia, Manuel,	South Somerset,	Fall River,	Oct. 5, 1920	Conviction.
Dumas, Joseph,	Dudley,	Webster,	June 15, 1920	Conviction.[1]
Fousica, Frank C.,	Fall River,	Fall River,	June 25, 1920	Conviction.
Glass, Anton,	North Dartmouth,	New Bedford,	June 22, 1920	Conviction.
Goldstein, Samuel,	Medway,	Franklin,	May 18, 1920	Conviction.
Gould, Leroy F.,	Sherborn,	Framingham,	Oct. 30, 1920	Dismissed.
Grigolonok, John,	Concord,	Concord,	Oct. 11, 1920	Conviction.[3]
Gurl, Joseph,	North Dartmouth,	New Bedford,	Aug. 11, 1920	Conviction.
Haber, Andrew,	South Hadley,	Northampton,	June 2, 1920	Conviction.
Hanscom, William,	Bolton,	Hudson,	Aug. 3, 1920	Conviction.
Harrison, Rose,	Barnstable,	Barnstable,	Sept. 24, 1920	Conviction.[4]
Haskell, George C.,	Orange,	Orange,	June 24, 1920	Conviction.
Houghton, Allan W.,	Amherst,	Northampton,	June 2, 1920	Conviction.
Huntley, Wm. H.,	Marblehead,	Marblehead,	Aug. 5, 1920	Conviction.

[1] Appealed.
[2] Responsibility assumed by Fanny Tucker.
[3] Case prosecuted in co-operation with Mr. H. E. Bowman, milk inspector, Somerville.
[4] Case prosecuted in co-operation with Mr. George T. Mecarta, milk inspector, Barnstable.

For Sale of Milk containing Added Water — Continued.

Name.	Address.	Court.	Date.	Result.
Jackson, Wm. O.,	Hardwick,	East Brookfield,	Feb. 5, 1920	Conviction.
Jarman, David,	Dracut,	Lowell,	Nov. 4, 1920	Conviction.
Jordan, Annie V.,	Pittsfield,	Pittsfield,	Dec. 17, 1919	Conviction.
Joyce, James,	Salem,	Salem,	Mar. 16, 1920	Conviction.
Karam, Sheehan,	Agawam,	Springfield,	Dec. 1, 1919	Conviction.
Katilin, Salome,	West Medway,	Franklin,	Oct. 9, 1920	Conviction.
Koziel, John,	Palmer,	Palmer,	Oct. 27, 1920	Conviction.
Larrabee, Harry A.,	Nantucket,	Nantucket,	Aug. 19, 1920	Conviction.
Machado, John,	Westport,	Fall River,	Aug. 10, 1920	Conviction.
Mailloux, Lorenzo,	Berkley,	Taunton,	Oct. 19, 1920	Conviction.
Maringo, Frank,	Fall River,	Fall River,	Apr. 21, 1920	Conviction.
Marquis, Horace,	Fall River,	Fall River,	Oct. 13, 1920	Conviction.
May, Charles P.,	Winchendon,	Winchendon,	May 5, 1920	Conviction.
Maynard, George E.,	Marlborough,	Marlborough,	Oct. 23, 1920	Conviction.
Mello, Angelo,	Fairhaven,	New Bedford,	Jan. 5, 1920	Conviction.
Mello, Joseph Costa,	Fall River,	Fall River,	Feb. 19, 1920	Conviction.
Mello, Joseph C.,	North Westport,	Fall River,	Oct. 26, 1920	Conviction.
Mingos, Charles,	Salem,	Salem,	Aug. 6, 1920	Conviction.
Palmer, William,	Pittsfield,	Pittsfield,	Dec. 17, 1919	Conviction.
Palmer, William H.,	Pittsfield,	Pittsfield,	June 11, 1920	Conviction.
Perry, Frank S.,	Attleboro,	Attleboro,	July 16, 1920	Conviction.[1]
Perry, Frank S.,	Attleboro,	Attleboro,	July 16, 1920	Conviction.[1]
Perry, John,	Dartmouth,	New Bedford,	Sept. 21, 1920	Conviction.
Proctor, Warren,	Lunenburg,	Leominster,	Aug. 13, 1920	Conviction.
Reposa, Manuel,	Somerset,	Fall River,	May 4, 1920	Conviction.
Reynolds, Sr., Frank,	Lexington,	Concord,	Aug. 6, 1920	Conviction.
Rezendes, John,	Somerset,	Fall River,	Oct. 5, 1920	Conviction.
Rich, John H.,	Truro,	Provincetown,	Sept. 8, 1920	Conviction.
Sampson, Leon A.,	Westborough,	Westborough,	June 30, 1920	Conviction.
Silva, Alexander,	Danvers,	Salem,	Mar. 16, 1920	Conviction.
Silva, Paul,	Middleborough,	Middleborough,	Nov. 13, 1920	Conviction.
Spaulding, James R.,	Salisbury,	Newburyport,	Sept. 10, 1920	Conviction.
Steele, Joseph,	Provincetown,	Provincetown,	Sept. 15, 1920	Conviction.[1]
Stockton, James,	Bellingham,	Franklin,	Aug. 28, 1920	Conviction.
Stone, John,	Sudbury,	Framingham,	June 9, 1920	Discharged.
Sullivan, John,	Lexington,	Concord,	Aug. 6, 1920	Conviction.
Sykes, Louis,	Norwood,	Stoughton,	Apr. 9, 1920	Conviction.

[1] Appealed.

For Sale of Milk containing Added Water — Concluded.

Name.	Address.	Court.	Date.	Result.
Sykes, Louis,	Norwood,	Stoughton,	Apr. 9, 1920	Conviction.
Sykes, Louis,	Norwood,	Stoughton,	Apr. 9, 1920	Conviction.
Sykes, Louis,	Norwood,	Stoughton,	Apr. 9, 1920	Conviction.
Tatro, Joseph,	South Hadley,	Northampton,	June 2, 1920	Conviction.
Tilden, Frank P.,	North Scituate,	Hingham,	Nov. 30, 1920	Conviction.
Tucker, Fanny,	Southbridge,	Southbridge,	Apr. 23, 1920	Conviction.
Twitchell, Lillian I.,	Holliston,	Framingham,	Oct. 16, 1920	Discharged.
Wiley, John H.,	Mansfield,	Attleboro,	June 4, 1920	Conviction.
Wolcoski, Russell,	South Billerica,	Lowell,	Nov. 4, 1920	Conviction.[1]
Yeziersky, Martin,	Agawam,	Springfield,	Dec. 2, 1919	Conviction.

For Sale of Cream below Legal Standard.

Graustein, Wm. A.,	Cambridge,	Waltham,	Jan. 7, 1920	Discharged.
Graustein, Wm. A.,	Cambridge,	Waltham,	Jan. 7, 1920	Conviction.[2]

For Sale of Adulterated Butter.

[Contained excess moisture.]

Ferguson, Hugh R.,	Hyannis,	Barnstable,	Aug. 12, 1920	Conviction.

For Sale of Adulterated Foods Other than Milk and Milk Products.

Clams.

[Contained added water.]

Anthony, George M.,	Chelsea,	Chelsea,	May 17, 1920	Discharged.
Brown, Rufus S.,	Newburyport,	Newburyport,	Sept. 10, 1920	Conviction.[2]
Fowler, Wm. L.,	Salisbury,	Newburyport,	Sept. 10, 1920	Conviction.
Pierce, Henry A.,	Boston,	Boston,	May 23, 1920	Conviction.[2]
Smart, Phillip A.,	Lynn,	Lynn,	Oct. 14, 1920	Discharged.
Wilcox, William J.,	Chelsea,	Chelsea,	May 17, 1920	Discharged.

Olive Oil.

[Adulterated with foreign oil.]

Alexion, Markos,	New Bedford,	New Bedford,	Mar. 5, 1920	Conviction.

[1] Case prosecuted in co-operation with Mr. H. E. Bowman, milk inspector, Somerville. [2] Appealed.

For Sale of Adulterated Foods Other than Milk and Milk Products — Continued.

OLIVE OIL — *Concluded.*

[Misbranded.]

NAME.	Address.	Court.	Date.	Result.
Caresi, Guiseppi,	Boston,	Boston,	Apr. 30, 1920	Conviction.
Geas, Fotios,	Fitchburg,	Fitchburg,	Mar. 23, 1920	Conviction.
Leonardi, Santi,	Lawrence,	Boston,	Apr. 30, 1920	Conviction.

SAUSAGE.

[Contained starch in excess of 2 per cent.]

Balkus, Andrew,	Lynn,	Lynn,	Dec. 9, 1919	Conviction.
Beauchamp, Ovilla,	Holyoke,	Springfield,	Feb. 10, 1920	Conviction.
Briggs, John W.,	Methuen,	Lawrence,	Mar. 25, 1920	Conviction.
Caton, Wm. E.,	Lowell,	Lowell,	Dec. 31, 1919	Conviction.
Cudahy Packing Company,	Boston,	Boston,	Mar. 10, 1920	Conviction.
Cudahy Packing Company,	Boston,	Boston,	Mar. 10, 1920	Conviction.
Cudahy Packing Company,	Boston,	Boston,	Mar. 10, 1920	Conviction.
Eberwein, John,	Pittsfield,	Pittsfield,	Jan. 23, 1920	Conviction.
Furneaux, Henry J.,	Lawrence,	Lawrence,	Jan. 30, 1920	Conviction.
Gavriluk, Alex,	Lawrence,	Lawrence,	Jan. 21, 1920	Conviction.
Holt, John,	Lawrence,	Lawrence,	Jan. 30, 1920	Discharged.
Holt, John,	Lawrence,	Lawrence,	Jan. 30, 1920	Conviction.
Johnston, Robert W.,	Lowell,	Lowell,	Jan. 22, 1920	Conviction.
Johnston, Robert W.,	Lowell,	Lowell,	Jan. 22, 1920	Conviction.
Kirschner, Frank,	Haverhill,	Haverhill,	Jan. 30, 1920	Conviction.
Mohawk Packing Company,	Boston,	Boston,	Jan. 16, 1920	Conviction.
Massachusetts Mohican Company.	Pittsfield,	Pittsfield,	Jan. 23, 1920	Conviction.
National Packing Company,	Boston,	Boston,	Mar. 11, 1920	Conviction.
National Packing Company,	Boston,	Boston,	Mar. 11, 1920	Conviction.
Park Sausage and Provision Company.	Boston,	Boston,	Feb. 4, 1920	Conviction.
Park Sausage and Provision Company.	Boston,	Boston,	Feb. 4, 1920	Conviction.
Park Sausage and Provision Company.	Boston,	Boston,	Feb. 4, 1920	Conviction.
Sayisek, John,	Lawrence,	Lawrence,	Jan. 30, 1920	Conviction.
Shedd, Harold H.,	Haverhill,	Haverhill,	Jan. 17, 1920	Conviction.
Thomas, Arthur,	Waltham,	Waltham,	Feb. 18, 1920	Conviction.
Wilner, Paul,	Haverhill,	Haverhill,	Apr. 2, 1920	Conviction.[1]
Wisniowski, Frank,	New Bedford,	New Bedford,	Jan. 20, 1920	Conviction.

[1] Appealed.

For Sale of Adulterated Foods Other than Milk or Milk Products — Continued.

SAUSAGE — *Concluded.*

[Contained coloring matter.]

NAME.	Address.	Court.	Date.	Result.
Massachusetts Mohican Company.	Pittsfield,	Pittsfield,	Jan. 23, 1920	Conviction.

SOFT DRINKS.

[Contained saccharine.]

Brezen, Joseph,	Lawrence,	Lawrence,	Oct. 1, 1920	Dismissed.[1]
Puzine, Jacob,	Lawrence,	Lawrence,	Oct. 1, 1920	Conviction.
Yuz, John,	Lawrence,	Haverhill,	Oct. 4, 1920	Conviction.

VINEGAR.

[Low in acid.]

Thomas, Mishan,[2]	Lawrence,	Lawrence,	Nov. 19, 1920	Conviction.
Thomas, Misrah,[2]	Lawrence,	Lawrence,	Nov. 19, 1920	Conviction.[3]

EGGS.

[Decomposed; unfit for food.]

Cohen, Louis,	Boston,	Boston,	Jan. 14, 1920	Conviction.
Economy Grocery Stores Company.	Malden,	Malden,	Dec. 11, 1919	Conviction.
Flood, Nathan B.,	North Adams,	Pittsfield,	Jan. 23, 1920	Conviction.
Flood, Nathan B.,	North Adams,	Pittsfield,	Jan. 23, 1920	Conviction.
Roosov, Abraham,	Stoneham,	Woburn,	Dec. 19, 1919	Conviction.[4]
Singer, Morris,	Boston,	Boston,	Mar. 19, 1920	Conviction.

False Advertising — Sale of Stale Eggs as Fresh Eggs.

Bay State Market Company,	New Bedford,	New Bedford,	Jan. 20, 1920	Conviction.
Blay, Philip F.,	Waltham,	Waltham,	Mar. 3, 1920	Conviction.
Janes, Charles W.,	Waltham,	Waltham,	Feb. 18, 1920	Conviction.
New Bedford Public Market,	New Bedford,	New Bedford,	Jan. 20, 1920	Conviction.
Newton Public Market,	Newton,	Newton,	Nov. 1, 1920	Conviction.[4]

[1] Left State before summons was served. Partner convicted.

[2] Case prosecuted in co-operation with the Lawrence Board of Health; analysis made by this Department.

[3] Continued for sentence.

[4] Appealed.

For Sale of Adulterated Foods Other than Milk or Milk Products — Continued.

EGGS — *Continued.*

Misbranded.

NAME.	Address.	Court.	Date.	Result.
Armour & Co.,	Boston,	Boston,	Mar. 11, 1920	Conviction.[1]
Flood, Nathan B.,	North Adams,	Pittsfield,	Dec. 30, 1919	Conviction.
Flood, Nathan B.,	North Adams,	Pittsfield,	Jan. 23, 1920	Conviction.
Flood, Nathan B.,	North Adams,	Pittsfield,	Jan. 23, 1920	Conviction.
Mills Tea and Butter Corporation.	Pittsfield,	Pittsfield,	Jan. 9, 1920	Conviction.
Rosen, Morris L.,	Boston,	Boston,	Jan. 23, 1920	Conviction.[1]
Simpson Brothers Company,	Boston,	Boston,	Jan. 23, 1920	Conviction.
Usave Stores, Inc.,	Waltham,	Waltham,	Mar. 3, 1920	Conviction.
Walsh, Fred J.,	Lowell,	Lowell,	Dec. 24, 1919	Conviction.
Young, Solomon N.,	Boston,	Boston,	Jan. 14, 1920	Conviction.

Selling Cold-storage Eggs without marking the Container.

Alpert, Morris,	East Boston,	East Boston,	Feb. 6, 1920	Conviction.
Angelo, Louis,	Lawrence,	Lawrence,	Jan. 21, 1920	Conviction.
Barthel, Eugene E.,	Gardner,	Gardner,	Nov. 26, 1920	Conviction.
Berube, George,	Lawrence,	Lawrence,	Mar. 25, 1920	Conviction.
Biband, J. Omer,	Amesbury,	Amesbury,	Jan. 12, 1920	Conviction.
Bikis, James,	Springfield,	Springfield,	Nov. 16, 1920	Conviction.
Blotner, Benjamin,	Haverhill,	Haverhill,	Jan. 17, 1920	Conviction.
Borges, Joauum J.,	New Bedford,	New Bedford,	Jan. 20, 1920	Conviction.
Brown, Charles N.,	Medford,	Malden,	Feb. 10, 1920	Conviction.
Brown, Joseph,	Boston,	West Roxbury,	Jan. 27, 1920	Conviction.
Carr, Hugh,	Medford,	Malden,	Feb. 10, 1920	Conviction.
Chesses, Barney,	Everett,	Malden,	Feb. 17, 1920	Conviction.
Cohen, Louis,	Boston,	Boston,	Jan. 14, 1920	Conviction.
Cohen, Max,	Waltham,	Waltham,	Mar. 8, 1920	Conviction.
Coutalonis, Thomas,	Woburn,	Woburn,	Nov. 5, 1920	Conviction.
Curtis, William N.,	Medford,	Malden,	Feb. 10, 1920	Conviction.
Danas, James,	Lowell,	Lowell,	Nov. 29, 1920	Conviction.
David, Moses,	East Boston,	East Boston,	Feb. 17, 1920	Conviction.
Desisto, Patrick,	Boston,	Boston,	Mar. 26, 1920	Conviction.
Direnski, Daniel,	Lowell,	Lowell,	Nov. 29, 1920	Conviction.
Donovan, Frank D.,	Lowell,	Lowell,	Nov. 22, 1920	Conviction.
Duffy, James,	Lowell,	Lowell,	Nov. 22, 1920	Conviction.

[1] Appealed.

For Sale of Adulterated Foods Other than Milk or Milk Products — Continued.

EGGS — *Continued.*

Selling Cold-storage Eggs without marking the Container — Continued.

NAME.	Address.	Court.	Date.	Result.
Eastwood, Albert,	New Bedford,	New Bedford,	Jan. 20, 1920	Conviction.
Finkelstein, Morris,	West Roxbury,	West Roxbury,	Feb. 3, 1920	Conviction.
Frentoz, Peter,	Springfield,	Springfield,	Nov. 17, 1920	Conviction.
Garber, Harry,	Boston,	Boston,	Jan. 14, 1920	Conviction.
Goldstein, Benjamin,	West Roxbury,	West Roxbury,	Feb. 3, 1920	Conviction.
Gordon, Milton,	Waltham,	Waltham,	Feb. 18, 1920	Conviction.
Gotohean, John,	Springfield,	Springfield,	Nov. 16, 1920	Conviction.
Green, Samuel,	Jamaica Plain,	West Roxbury,	Jan. 27, 1920	Conviction.
Guillet, J. Arthur,	New Bedford,	New Bedford,	Jan. 20, 1920	Conviction.
Handy Company, H. L.,	Springfield,	Pittsfield,	Jan. 23, 1920	Conviction.
Harkins, Wm. A.,	Woburn,	Woburn,	Nov. 5, 1920	Conviction.
Harring. Herbert,	East Boston,	East Boston,	Feb. 6, 1920	Conviction.
Hoxie, Charles E.,	Brockton,	Brockton,	Feb. 4, 1920	Conviction.
Jewell, Fred M.,	Amesbury,	Amesbury,	Jan. 12, 1920	Conviction.
Juk, Max,	Boston,	Boston,	Mar. 26, 1920	Conviction.[1]
Kapner, Hyman,	New Bedford,	New Bedford,	Jan. 20, 1920	Conviction
Katz, Philip,	Chelsea,	Chelsea,	Jan. 2, 1920	Conviction.
Kirshner, Nathan,	Boston,	Boston,	Jan. 14, 1920	Conviction.
Kramer, Ernest,	Jamaica Plain,	West Roxbury,	Jan. 27, 1920	Conviction.
Manninen, Herman,	Gardner,	Gardner,	Nov. 26, 1920	Conviction.
Melinski, Frank,	Lawrence,	Lawrence,	Jan. 21, 1920	Conviction.
Morris & Co.,	New Bedford,	New Bedford,	Jan. 20, 1920	Conviction.
Nadler, Abraham,	Springfield,	Springfield,	Nov. 16, 1920	Conviction.
Newton Public Market,	Newton,	Newton,	Nov. 1, 1920	Conviction.[1]
Nowak, Joseph,	Amesbury,	Amesbury,	Jan. 12, 1920	Conviction.
Perham, George L.,	Lowell,	Lowell,	Nov. 29, 1920	Conviction.
Poulin, Joseph,	Amesbury,	Amesbury,	Jan. 12, 1920	Conviction.
Rayman, Harry,	Medford,	Malden,	Jan. 28, 1920	Conviction.[1]
Reid, Greenleaf W.,	Brockton,	Brockton,	Feb. 4, 1920	Discharged.
Reid Company, G. W.,	Brockton,	Brockton,	Mar. 1, 1920	Conviction.[1]
Renkert, George,	Malden,	Malden,	Feb. 24, 1920	Conviction.
Rosenberg, Abraham,	Boston,	Boston,	Jan. 14, 1920	Conviction.
Ruttenberg, Abraham,	Newton,	Newton,	Nov. 1, 1920	Conviction.[2]
Sawink, Elias,	Pittsfield,	Pittsfield,	Jan. 23, 1920	Conviction.
Scaltrito, John,	Boston,	Boston,	Jan. 14, 1920	Conviction.

[1] Appealed.

[2] Fined $25; sentence suspended.

For Sale of Adulterated Foods Other than Milk and Milk Products — Concluded.

EGGS — *Concluded.*

Selling Cold-storage Eggs without marking the Container — Concluded.

NAME.	Address.	Court.	Date.	Result.
Seaman, John H.,	New Bedford,	New Bedford,	Jan. 20, 1920	Conviction.
Sevitch, Morris,	New Bedford,	New Bedford,	Jan. 20, 1920	Conviction.
Silvia, Frank S.,	New Bedford,	New Bedford,	Jan. 20, 1920	Conviction.
Simonello, Rocco,	Haverhill,	Haverhill,	Jan. 17, 1920	Conviction.
Smith, Abraham,	Everett,	Malden,	Feb. 10, 1920	Conviction.
Sorakes, Efine,	Springfield,	Springfield,	Nov. 17, 1920	Conviction.
Specter, David,	New Bedford,	New Bedford,	Jan. 20, 1920	Conviction.
Spellman, Louis,	New Bedford,	New Bedford,	Jan. 20, 1920	Conviction.
Stepnowski, Louis,	Pittsfield,	Pittsfield,	Jan. 23, 1920	Conviction.
Terzepacz, Paul,	Pittsfield,	Pittsfield,	Jan. 23, 1920	Conviction.
Tillman, Samuel,	Springfield,	Springfield,	Nov. 16, 1920	Conviction.
Tobis, Angelo,	Springfield,	Springfield,	Nov. 16, 1920	Conviction.
Whittemore, Ichabod,	Lawrence,	Lawrence,	Jan. 21, 1920	Conviction.
Winer, Israel,	Chelsea,	Chelsea,	Jan. 8, 1920	Conviction.
Zajac, Michael,	New Bedford,	New Bedford,	Jan. 20, 1920	Conviction.

For Sale of Decomposed Food.

DELIVERING DECOMPOSED MEAT.

Knight & Co., Inc.,	Boston,	Charlestown,	Mar. 24, 1920	Conviction.

RAISINS.

Kehayas, James C. (2 counts),	Boston,	Boston,	July 6, 1920	Conviction.
Segal, Jacob N. (2 counts),	Boston,	Boston,	July 6, 1920	Conviction.
Zidros, John (2 counts),	Boston,	Boston,	July 6, 1920	Conviction.

SAUSAGE.

David, Moses,	East Boston,	East Boston,	Feb. 17, 1920	Conviction.
Goldberg, Wolfe L.,	Fall River,	Fall River,	Feb. 19, 1920	Conviction.

OBSTRUCTION OF AN INSPECTOR.

Perry, Frank S.,	Attleboro,	Attleboro,	July 16, 1920	Conviction.[1]

[1] Appealed.

For Violation of the Laws relative to Cold Storage.

RETURNING TO COLD-STORAGE ARTICLES OF FOOD ONCE REMOVED THEREFROM FOR THE PURPOSE OF PLACING ON THE MARKET FOR SALE.

NAME.	Address.	Court.	Date.	Result.
Cushing Beef Company,	Boston,	Boston,	Sept. 27, 1920	Conviction.

HOLDING ARTICLES OF FOOD IN COLD STORAGE FOR A PERIOD LONGER THAN TWELVE MONTHS WITHOUT THE CONSENT OF THE DEPARTMENT OF PUBLIC HEALTH.

Batchelder & Snyder,	Boston,	Boston,	Jan. 14, 1920	Nol-prossed.
Bay State Fishing Company (10 counts).	South Boston,	Boston,	Feb. 9, 1920	Conviction.[1]
Burns Company, Inc., John (7 counts).	South Boston,	Boston,	Feb. 9, 1920	Conviction.[1]
Cann's Sea Grill, Inc.,	Boston,	Boston,	Mar. 10, 1920	Conviction.[1]
Cefalu, Joseph,	Boston,	Boston,	Mar. 24, 1920	Conviction.
Chatham Freezer Company,	Boston,	Boston,	Jan. 19, 1920	Conviction.[1]
Ginter Company (2 counts),	South Boston,	Boston,	Feb. 9, 1920	Conviction.[1]
Libby, Samuel (8 counts),	Boston,	Boston,	Oct. 27, 1920	Conviction.
Libby, Samuel (8 counts),	Boston,	Boston,	Oct. 27, 1920	Conviction.
McKeon, Wm. F. (2 counts),	Watertown,	Boston,	Feb. 9, 1920	-[2]
Prevoir, Frank,	Boston,	South Boston,	May 25, 1920	Conviction.
Rodman, Benjamin W.,	Boston,	Boston,	Jan. 14, 1920	Conviction.
Security Trust Company,	Lynn,	Boston,	Sept. 16, 1920	Conviction.
Shattuck & Jones,	Boston,	Boston,	Feb. 20, 1920	Conviction.[1]
Story & Simmons Company (2 counts).	South Boston,	Boston,	Feb. 9, 1920	Conviction.[1]

RETAINING FOOD IN COLD STORAGE AFTER IT HAD BEEN DECLARED UNWHOLESOME BY THE DEPARTMENT OF PUBLIC HEALTH.

Brockton Public Market, Inc.,	Brockton,	Boston,	Sept. 23, 1920	Conviction.[1]
Libby, Samuel,	Boston,	Boston,	Oct. 27, 1920	Conviction.

REMOVING ARTICLES OF FOOD FROM STORAGE WITHOUT INSPECTION BY THE DEPARTMENT OF PUBLIC HEALTH AFTER SUCH FOOD HAD BEEN STORED FOR MORE THAN TWELVE CALENDAR MONTHS.

Bay State Fishing Company (8 counts).	South Boston,	Boston,	Feb. 9, 1920	Conviction.[1]
Burns Company, Inc., John (4 counts).	South Boston,	Boston,	Feb. 9, 1920	Conviction.[1]
McKeon, William F. (2 counts).	Watertown,	Boston,	Feb. 9, 1920	-[2]
Story & Simmons Company (2 counts).	South Boston,	Boston,	Feb. 9, 1920	Conviction.[1]

[1] Defaulted; charges taken to be true.

[2] On file, without plea.

For Violation of the Laws relative to Cold Storage — Concluded.

Retailing Cold-storage Goods without displaying a Sign marked "Cold Storage Goods Sold Here."

Name.	Address.	Court.	Date.	Result.
Goldberg, Wolfe L.,	Fall River,	Fall River,	Feb. 19, 1920	Conviction.
Green, Isaac,	Jamaica Plain,	West Roxbury,	Jan. 27, 1920	Conviction.
Lipson, Morris,	Boston,	Boston,	Jan. 14, 1920	Conviction.
Scaltrito, John,	Boston,	Boston,	Jan. 14, 1920	Conviction.
Vartan, George M.,	Jamaica Plain,	West Roxbury,	Jan. 27, 1920	Conviction.

Displaying Cold-storage Eggs without the Necessary Sign.

Gaouette, Napoleon J.,	New Bedford,	New Bedford,	Jan. 20, 1920	Conviction.

Representing Cold-storage Food as Fresh Food.

Bay State Market,	New Bedford,	New Bedford,	Jan. 20, 1920	Conviction.

Operating a Refrigerating Warehouse without a License issued by the Department of Public Health.

Whittemore, Ichabod,	Lawrence,	Lawrence,	Jan. 21, 1920	Conviction.

For Violation of the Laws relative to Slaughtering.

Illegal Use of Stamp.

Pederson, Iner (2 counts),	Acton,	Concord,	Apr. 14, 1920	Conviction.

Slaughtering or authorizing Slaughtering in the Absence of Inspector.

Gold, Samuel,	Pittsfield,	Pittsfield,	Feb. 2, 1920	Conviction.
McIntire, Ralph W. (2 counts),	Fitchburg,	Fitchburg,	June 19, 1920	Conviction.[1]
Shenkman, Oscar,	New Marlborough,	Great Barrington,	Aug. 25, 1920	Conviction.
Slomitsky, Max,	Great Barrington,	Great Barrington,	Aug. 18, 1920	Conviction.
Weaver, George,	West Acton,	Concord,	Apr. 14, 1920	Conviction.
Winkler, Conrad R.,	Adams,	Adams,	May 5, 1920	Conviction.

[1] Appealed.

For Violation of the Laws relative to Slaughtering — Concluded.

SELLING, OFFERING FOR SALE, OR HAVING IN POSSESSION WITH INTENT TO SELL, UNSTAMPED MEAT.

NAME.	Address.	Court.	Date.	Result.
Brodsky, Barney,	Fitchburg,	Fitchburg,	June 15, 1920	Conviction.
Corey, Frank R.,	Newport, R. I.,	Fall River,	Jan. 30, 1920	Conviction.
Dumaine, Wilfred,	Westport,	Fall River,	Aug. 3, 1920	Conviction.
Rutman, Jacob,	Fitchburg,	Fitchburg,	June 15, 1920	Conviction.
Shenkman, Oscar,	New Marlborough,	Great Barrington,	Aug. 25, 1920	Conviction.
Winkler, Conrad R.,	Adams,	Adams,	May 5, 1920	Conviction.

SELLING OR DELIVERING CARCASSES OF AN ANIMAL WHICH HAD COME TO ITS DEATH OTHERWISE THAN BY SLAUGHTER WHILE IN A HEALTHY CONDITION.

Cunningham, Phillip,	Boxborough,	Concord,	May 11, 1920	Conviction.
Slomitsky, Max,	Great Barrington,	Lee,	Aug. 24, 1920	Conviction.
Stoskin, Morris,	Great Barrington,	Lee,	Aug. 24, 1920	Conviction.

HAVING UNWHOLESOME MEAT IN HIS POSSESSION WITH INTENT TO SELL THE SAME.

Friedman, Samuel,	Fitchburg,	Fitchburg,	June 15, 1920	Conviction.[1]
Mirman, Barney,	Monterey,	Great Barrington,	Aug. 18, 1920	Conviction.

SELLING OR OFFERING FOR SALE IMMATURE VEAL.

Kirby, Perry,	East Chatham, N. Y.	Pittsfield,	Feb. 13, 1920	Conviction.
Sousini, James,	Pittsfield,	Pittsfield,	June 4, 1920	Conviction.

AS INSPECTOR OF SLAUGHTERING VIOLATED THE RULES AND REGULATIONS OF THE DEPARTMENT OF PUBLIC HEALTH.

Farnum, Walter F.,	Lanesborough,	Pittsfield,	Feb. 13, 1920	Conviction.
Fobes, Edward S.,	Acton,	Concord,	Apr. 14, 1920	Conviction.
Powers, Wm. P.,	Lee,	Lee,	June 3, 1920	Conviction.

[1] Appealed.

Division of Communicable Diseases

Bernard W. Carey, M.D., *Director*

Report of Division of Communicable Diseases.

The activities of the Division of Communicable Diseases have continued along the same general lines as in past years. Much time and effort have been expended in making our morbidity reports more complete, and it is believed some measure of success has been attained.

The co-operative arrangement with the Division of Registration in Medicine made in the early part of the year has proved most beneficial and far preferable to court action for violators of the law of reporting those diseases declared dangerous to public health.

Critical analysis of our mortality rates shows an appreciable decline in most of the diseases over that for the year 1915 and for the median year of the period 1906–1915. A glance at the rates for previous years proves beyond question that a saving of life has resulted from our efforts, and the economic gain to the State far exceeds the cost of this work.

The following tabulation shows for the seven most prevalent diseases not only our gains but also our losses, forcibly pointing out the need for further work in whooping cough and measles: —

Disease.	Median, 1906-1915.	1915.	1920.
Diphtheria,	20.1	19.4	15.4
Scarlet fever,	7.8	4.9	5.5
Typhoid fever,	11.8	6.7	2.4
Measles,	6.7	4.0	9.0
Epidemic cerebrospinal meningitis,	4.3	3.4	3.3
Whooping cough,	7.6	7.6	14.0
Tuberculosis,	132.7	113.2	97.2

The personnel of the Division has undergone many changes. Owing to our inability to secure properly qualified persons for District Health Officers it has appeared wise to redistrict the State into seven districts rather than eight as formerly. It is yet too soon to form an opinion as to whether or not this plan may be worked out advantageously and without too great a burden upon the District Health Officers affected by the change.

The following persons have resigned from the Department: —

Clark, Charles. Publicity agent in the Subdivision of Venereal Diseases. Services terminated Sept. 15, 1920.
Keenan, James A., M.D. District Health Officer, Berkshire Health District. Services terminated Feb. 10, 1920.
Lovell, Bertha C. Supervising investigator, Subdivision of Venereal Diseases. Services terminated Sept. 30, 1920.
Osborn, Stanley H., M.D. Epidemiologist. Services terminated April 30, 1920.
Roberts, Bertrand E., M.D. District Health Officer, Connecticut Valley Health District. Services terminated July 31, 1920.
Rogers, Emily M. Nursing assistant, Northeastern Health District. Services terminated June 30, 1920.

The following appointments were made: —

Chace, Mrs. Sara W. Nursing assistant, Southeastern Health District. Appointed Sept. 7, 1920.
Henry, Jonathan E., M.D. Epidemiologist. Appointed June 1, 1920.
Miner, Harold E., M.D. District Health Officer, Connecticut Valley Health District. Appointed Nov. 22, 1920.
Pfeiffer, Albert, M.D. Epidemiologist, Subdivision of Venereal Diseases. Appointed Jan. 1, 1920.

Routine inspections of hospitals and jails, lock-ups and houses of correction were carried on as in previous years, with no marked change noted in the conditions present.

Sixty-seven dispensaries, under the dispensary licensing law, submitted applications for licenses to the Department. In each instance the dispensary submitting application was found to be operating for public benefit, and the license was therefore granted.

The reported incidence of communicable diseases for the year 1920 has reached a total of 135,242, with the rather remarkable fact that there has been no localized outbreak of alarming proportions at any one time. Influenza, with 36,312 cases, measles, with 32,141 cases, scarlet fever, with 10,260 cases, and whooping cough, with 9,994 cases, have been of State-wide prevalence.

The reported incidence of measles and whooping cough is larger than has ever been recorded in Massachusetts. It has been impossible to determine accurately what factors are responsible for these increases. Epidemiological investigation shows conclusively that increased effort to limit the spread of these two conditions must be directed at the preschool age group because it is here that both morbidity and mortality rates reach their peak.

The morbidity and mortality of *whooping cough* occurring as they do in the years of early childhood should clearly place it in the fore-

ground of our endeavors. The history of so many needless exposures with their dire result calls for special activity on our part. We must overcome by persistent educational attacks the mistaken impression that children are bound to have this or that disease and that they "may as well have it and get over with it." If our people are insistent in this belief, they should at least choose that period of life which gives the least fatality and not that which gives the greatest.

In spite of the fact that many public health officials feel there is nothing to be done about *measles* because of its extreme contagiousness in the pre-eruptive stage, it is believed that persistent effort in the beginning of an outbreak will do much to limit its spread and to effect a diminution of cases. A school nurse, with a thermometer, sending home from school children showing the slightest rise of temperature and the careful instruction of mothers as to the isolation of the first case and subsequent isolation of other children of her household showing symptoms of illness of any sort will do much to limit the incidence of this condition. Our experience during the past year in a few isolated instances has definitely proved the efficacy of these precautions.

The reported incidence of *diphtheria* is still too high to warrant any degree of satisfaction over its control. Much time, thought and energy have been given to the control of this condition, and it is gratifying to see an increase in the culturing for diagnosis and more attention being paid to the carrier state. More and more is it evident that endemic diphtheria will never be controlled by antitoxin and quarantine measures alone. Our efforts must be extended to a search for all possible contacts with a known case, their culturing, and with immediate immunization by antitoxin of those showing positive cultures. Schick tests, to determine the non-immune group of the community with their subsequent immunization by the toxin-antitoxin mixture, should be persistently applied. There are several indications that in the near future the efforts of the Department and the local boards of health to control diphtheria will bear fruit. As shown by our records, physicians are utilizing the laboratory for diagnoses with increasing frequency, which must of course result in the earlier diagnosis of diphtheria and the earlier administration of the antitoxin. Demonstrations by Dr. White, Director of the Division of Biologic Laboratories, and the District Health Officers to physicians and local boards of health of the method of performing the Schick test, together with the reading of the findings, will make the future control of diphtheria more satisfactory. There can be no doubt that diphtheria prevention and control call for the widespread dissemination of the knowledge that all agencies for its control are available to the people of the Commonwealth.

For the first time in the history of the Department the deaths from

typhoid fever are less than 100. This yearly decrease in the death rate from typhoid fever is most gratifying and by its consistency points out that intensive investigation of the individual case for sources of infection, with proper preventive measures applied thereto, is the proper and logical procedure for typhoid control. Massachusetts, because of its carefully guarded water supplies, its adequate sewage disposal and the relatively large amount of pasteurization of its milk, finds future control limited to a large extent to contact with individual cases and the typhoid carrier. There can be no doubt that the immunization of our male group between the ages of twenty and forty who served in the Army and Navy during the late war has had an appreciable effect upon our rate. Prior to this year statistics have shown in both morbidity and mortality an excess of males over females. This year it is noted that conditions are reversed and that females are predominating in this age group. This is, of course, additional evidence pointing out the wisdom of vaccinating our citizens against typhoid and particularly of including our female population as well as the male. It is recorded that 34 of our cases occurred in institutions among patients where typhoid prevention may be so well carried out. It is also regrettable that 10 cases were reported among nurses or attendants in our hospitals where, because of the intimate association with typhoid cases, infection is so likely to occur. There is need of reiterating our warning of 1919 and to assist as far as we may in the immunization of all inmates of institutions and of all who, because of their work, may be unduly exposed.

We now have under supervision 55 typhoid carriers, of whom 7 were discovered this year, — 4 through examinations made in the Bacteriological Laboratory of this Department and 3 through local laboratories. Two of these carriers who presented positive fæces or urine gave negative or atypical Widal reactions. This points out the necessity of not placing too much reliance upon the Widal when other evidence points to the possibility of an individual being responsible for a given case or outbreak.

The reported incidence of *lobar pneumonia* does not present a true picture of the actual incidence and it is questionable whether or not we will ever be able to differentiate between broncho-pneumonia, influenza pneumonia and the secondary pneumonias with sufficient accuracy from the reports to feel with any degree of certainty that we have the correct index of the incidence of lobar pneumonia.

Scarlet fever showed the same widespread distribution with undue incidence as in measles and whooping cough. Investigation shows that much of the infection was transmitted from the mild and often times

unrecognized case. It was a frequent history that a given child was taken out of a school peeling and that he had been in constant attendance with the exception perhaps of one day, frequently being absent from school the Friday before and appearing Monday with evidence of a slight unaccounted-for rash. Until more thorough school inspection is available, conditions similar to this must go on and will cause much waste of school time and money of our citizens.

The mortality rates of *pulmonary tuberculosis* have shown a gratifying decrease for the year 1920. The reported incidence is approximately that of the preceding year. An increase in the reported incidence is looked for, however, because of the special activities of the local boards of health through their follow-up work with contacts and the Department of Public Health with its consultation clinics. Never before has there been such a concerted effort by all interested in the control of tuberculosis towards early diagnosis through State, county and municipal clinics with special attention paid by nutritional and public health workers in the field of the school-age group. It appears that it is in this group our future efforts must be actively centered, and marked results may be expected if the present day theory of the early infection of tuberculosis is tenable.

The public health aspect of *tuberculosis of other forms* is rapidly receiving more attention in the minds of health officials. There is no doubt that the forms of non-pulmonary tuberculosis which need surgical attention should be placed in hospitals where competent surgeons and orthopedists are in attendance. With a death rate approximating 20 per 100,000 over a period of the last ten years other forms of tuberculosis should receive the immediate and serious attention of this Department.

A gradual decrease in the reporting of *ophthalmia neonatorum* is to be seen, and the cities and towns now taking care of their own cases have reached 42. There were but three instances where impaired vision occurred. Of the total 1,638 cases, 1,205 were under fifteen days, 307 between fifteen days and three months, and 126 were three months and over. It is interesting to note that many of the cases reported as ophthalmia neonatorum were in reality eyes red, swollen and showing an unnatural discharge due to the use of silver nitrate unneutralized by the addition of salt solution.

There have been 67 *dog-bite* cases reported during the year, an increase over any preceding year. It is interesting to note that by far the greatest majority of these cases are limited to the southeastern section of the State. It is our belief that the time has come when efforts should be made to lessen the incidence of dog bites in Massa-

chusetts by at least restraining dogs on leashes while on the street and by a systematic campaign against the stray or ownerless dog. Fifty-two cases of dog bite received antirabic treatment.

Anterior poliomyelitis is treated in another section of this report and will receive only passing notice here. Our investigations have proved nothing which was not shown by the investigations of the outbreak of 1916. Multiple cases in a given household were extremely rare. There was no change in the age incidence and no new light shown on its mode of transmission. The only outstanding feature was the comparative freedom from infection in the western part of the State. A triangle with its apex at Worcester and base drawn along the waterfront would include practically all of the incidence. This alone differs from 1916 when the State, as a whole, was infected. Of what epidemiological significance this may be is unknown, but may possibly be explained by the early infection of the eastern part of the State and the colder weather preventing its advance westward.

The special work done in conjunction with the Harvard Infantile Paralysis Commission was too limited to allow any definite conclusions to be drawn. It does appear, however, that lumbar puncture with the bedside determination of cellular content is a practical procedure and one which should become a part of our service to the physicians of the State. Herein lies a golden opportunity for the differentiation of the various meningeal conditions with the subsequent administration of antimeningococcic serum in the event that it is indicated.

There was a decrease in the number of cases of *anthrax* reported during the year. There were 17 cases, of which 7 were in Peabody, 3 in Lowell, and the rest scattered, with 1 each in Stoneham, Chelsea, Lawrence, Hudson, Newton, Winchester and Worcester. The infection was traced to hides in 11 cases, wool in 1 case and hair in 1 case. Source of infection in 4 cases was unknown.

Mumps, with 5,962 cases reported, an increase of about 2,500 over the preceding year, is worthy of comment. Here, as in the case of the other frequently reported diseases, incidence has been scattered throughout the State. The mortality was almost negligible.

A lessened incidence of *epidemic cerebrospinal meningitis* for the year was noted, 182 cases being reported. Three attempts were made to detect possible carriers where the patient gave the history of recently being admitted to this country. Over 100 nasopharyngeal cultures were taken at the immigration station, all of which proved negative.

There was but one outbreak of *septic sore throat* reported during the year which was milk-borne, and cultures taken from a milk handler proved to be of the hemolytic type. There has been some question in

the minds of physicians as to what exactly might constitute septic sore throat and it has been repeatedly stated by the members of this Department that in our opinion a septic sore throat is one which exhibits a virulent hemolytic streptococcus. It is believed that if all public health officials accept this definition our reports of septic sore throat will be diminished in number and a more complete picture of the true incidence will be obtained.

There were 37 cases of *dysentery* which, with the exception of 9 cases which occurred in August at the Medfield State Hospital, were in various sections of the State. The question has been raised whether institutional dysentery may not properly be of paratyphoid origin, rather than due to other causes. The attention of the Department and local boards of health should be directed to the possibility of dysentery being imported into this country through immigration, and careful investigation of the individual case should be carried out.

There were 29 cases of *smallpox* reported during the year, with two distinct outbreaks, — one in May in Boston with 8 cases and 1 in Braintree connected with this outbreak, and one in December in Methuen with 14 cases reported during the month, 9 of which were in one family. The source of infection in these outbreaks as well as in the other cases was outside of Massachusetts. The majority were directly traceable to the mild outbreak that occurred in Canada.

There were 25 cases of *tetanus* reported during the year. This does not represent the total number of cases, however, of tetanus occurring in the State because of the fact that 21 deaths have been recorded.

Pellagra was reported in 16 instances, 9 cases of which were found in State institutions.

There were 3 cases of *actinomycosis* and 3 cases of *leprosy* reported.

REPORT OF THE STATE DISTRICT HEALTH OFFICERS.

The duties enjoined upon the State District Health Officers are numerous and varied. They are the field agents of the Department and are the representatives of the Commissioner of Public Health in their respective districts. They are in frequent contact with boards of health, local health officers and workers, advising with them regarding the many problems incident to daily routine health administration; they are constantly in touch with the occurrence of cases of disease dangerous to the public health as reported each day to local boards of health, alert to inquire into or be of assistance in any instance where such diseases are found to be newly occurring or showing increasing prevalence.

In this connection they are often called upon to aid in establishing a diagnosis in doubtful cases, *e.g.*, in distinguishing between chicken pox and smallpox, in deciding whether a given case is scarlet fever, or in determining the nature of the trouble in a suspected case of infantile paralysis.

The State District Health Officers annually inspect all jails, houses of correction, station houses, lock-ups, places of detention, all hospitals and dispensaries, public or private, as required by law.

In addition they are subject to the performance of any special work assigned by the Department; such tasks include unusual investigations in the field, *e.g.*, an inquiry into the circumstances of maternal mortality, studies relating to infant mortality rates, surveys in given communities to determine the extent and prevalence of tuberculosis, promoting the formation of a voluntary health district with the employment of a full-time health officer; under this is included also service on committees for various purposes, — the preparation of suggested minimum rules for the control of communicable diseases, to consider new possibilities of educational work, etc.

Nursing Assistants.

The work of the nursing assistants is concerned to a considerable extent with tuberculosis, — visiting the tuberculosis dispensaries and individual cases in communities where there is no nursing service, and in attempting to raise the standard of tuberculosis work, and in coordinating such work on the part of the public and various private agencies.

They are also called upon to assist in other phases of the work of the Department, especially in connection with educational measures as carried out through lectures and health exhibits, and in investigating the occurrence of cases of communicable disease.

Educational Work.

Though the consideration of the educational work of the Department will be found in the report of the Division of Hygiene, a brief statement of the share of the District Health Officers and nursing assistants in such work is properly included here.

During the year 199 lectures were given in 88 cities and towns before audiences aggregating approximately 14,000. The subjects discussed had to do with various phases of health work, — the prevention of disease, the promotion of health, the need for trained health workers, etc.

Many talks were sought or arranged to aid in the solution of some particular problem or to assist in the creation of a public opinion which should eventually bring about appropriations for specific purposes, such as the employment of a public health or school nurse, the establishment of a dental clinic, etc.

Realizing from experience that most graduate nurses, though excellently qualified through their training for their professional duties, lacked adequate knowledge of public health and public health work, a course of eight lectures on health administration and work was prepared by the District Health Officers and other members of the Department. Through the co-operation of the Association of Training School Superintendents this course was given in some 20 or more hospitals before groups aggregating about 700 nurses in training. Much interest was manifested. This work will be repeated the ensuing year under the management of the Division of Hygiene.

In this connection it may be emphasized that much, if not most of the work of the District Health Officers and nursing assistants is distinctly, though indirectly, educational. For in the field there is constant opportunity for the quiet and unobtrusive spreading of health knowledge and propaganda. In retrospect it is clearly manifest that such continued effort has represented no small part in bringing about in this Commonwealth the increased interest of the present day in all matters pertaining to health.

Diseases dangerous to the Public Health.

The unusual prevalence of some of the communicable diseases, notably scarlet fever and diphtheria, has been due, in great degree, as determined by field experience, to contact infection, favored by a quarantine too short or poorly observed, and to "missed" or mild, unrecognized cases. Cases of nasal diphtheria were frequent, and in many instances served as a source of infection. It was also observed that in many instances the earlier cases in a household received no medical attention until a later case showed more pronounced or alarming symptoms. It was noted further, also, that many times second and multiple cases occurred in the same household at intervals which indicate that household immunization was not carried out.

Details regarding the communicable disease work will be found in the report of the epidemiologist.

District Changes.

During the year, following the passage of legislation, the number of State District Health Officers was reduced from 8 to 7. This necessitated a corresponding change in district boundaries.

To District No. 2 have been added Ashland, Framingham, Holliston, Hopkinton, Marlborough, Natick and Sherborn.

Ashby, Ayer, Groton, Hudson, Pepperell, Shirley and Townsend have been added to District No. 4.

The towns in Worcester County formerly in Districts Nos. 5 and 6 have been consolidated into the "Worcester County District," known as District No. 5.

There have been added to District No. 7 the towns of New Salem, Orange and Warwick.

A list of the districts as now constituted, together with the names of the District Health Officers and nursing assistants, follows: —

Health Districts and State District Health Officials.

The Southeastern District — No. 1.

Acushnet.
Attleboro.
Barnstable.
Berkley.
Bourne.
Brewster.
Carver.
Chatham.
Chilmark.
Dartmouth.
Dennis.
Dighton.
Duxbury.
Eastham.
Edgartown.
Fairhaven.
Fall River.
Falmouth.
Freetown.
Gay Head.
Gosnold.
Harwich.
Kingston.
Lakeville.
Mansfield.
Marion.
Mashpee.
Mattapoisett.
Middleborough.
Nantucket.
New Bedford.
Norton.
Oak Bluffs.
Orleans.
Plymouth.
Plympton.
Provincetown.
Raynham.
Rehoboth.
Rochester.
Sandwich.
Seekonk.
Somerset.
Swansea.
Taunton.
Tisbury.
Truro.
Wareham.
Wellfleet.
West Tisbury.
Westport.
Yarmouth — 52.

Dr. Charles W. Milliken, 411 Book Store Building, New Bedford, *State District Health Officer.*
Mrs. Sara W. Chace, *Nursing Assistant.*

The Eastern District — No. 2.

Abington.	Halifax.	Norwell.
Ashland.	Hanover.	Norwood.
Avon.	Hanson.	Pembroke.
Bellingham.	Hingham.	Plainville.
Boston.	Holbrook.	Quincy.
Braintree.	Holliston.	Randolph.
Bridgewater.	Hopkinton.	Rockland.
Brockton.	Hull.	Scituate.
Brookline.	Marlborough.	Sharon.
Cambridge.	Marshfield.	Sherborn.
Canton.	Medfield.	Stoughton.
Cohasset.	Medway.	Walpole.
Dedham.	Millis.	Wellesley.
Dover.	Milton.	West Bridgewater.
East Bridgewater.	Natick.	Westwood.
Easton.	Needham.	Weymouth.
Foxborough.	Newton.	Whitman.
Framingham.	Norfolk.	Wrentham — 56.
Franklin.	North Attleborough.	

Dr. George T. O'Donnell, 546 State House, Boston, *State District Health Officer.*
Miss Cecilia A. Lemner, *Nursing Assistant.*

The Northeastern District — No. 3.

Amesbury.	Lynnfield.	Revere.
Beverly.	Malden.	Rockport.
Boxford.	Manchester.	Rowley.
Chelsea.	Marblehead.	Salem.
Danvers.	Melrose.	Salisbury.
Essex.	Merrimac.	Saugus.
Everett.	Middleton.	Stoneham.
Georgetown.	Nahant.	Swampscott.
Gloucester.	Newbury.	Topsfield.
Groveland.	Newburyport.	Wakefield.
Hamilton.	North Reading.	Wenham.
Haverhill.	Peabody.	West Newbury.
Ipswich.	Reading.	Winthrop — 40.
Lynn.		

Dr. Lyman A. Jones, Willey House, Swampscott, *State District Health Officer.*
Miss M. Gertrude Martin, *Nursing Assistant.*

The North Midland District — No. 4.

Acton.	Dunstable.	Somerville.
Andover.	Groton.	Stow.
Arlington.	Hudson.	Sudbury.
Ashby.	Lawrence.	Tewksbury.
Ayer.	Lexington.	Townsend.
Bedford.	Lincoln.	Tyngsborough.
Belmont.	Littleton.	Waltham.
Billerica.	Lowell.	Watertown.
Boxborough.	Maynard.	Wayland.
Burlington.	Medford.	Westford.
Carlisle.	Methuen.	Weston.
Chelmsford.	North Andover.	Wilmington.
Concord.	Pepperell.	Winchester.
Dracut.	Shirley.	Woburn — 42.

Dr. Charles E. Simpson, 100 Holyrood Avenue, Lowell, *State District Health Officer.*

Miss Mildred F. Ashley, *Nursing Assistant.*

The Worcester County District — No. 5.

Ashburnham.	Hopedale.	Royalston.
Athol.	Hubbardston.	Rutland.
Auburn.	Lancaster.	Shrewsbury.
Barre.	Leicester.	Southborough.
Berlin.	Leominster.	Southbridge.
Blackstone.	Lunenburg.	Spencer.
Bolton.	Mendon.	Sterling.
Boylston.	Milford.	Sturbridge.
Brookfield.	Millbury.	Sutton.
Charlton.	Millville.	Templeton.
Clinton.	New Braintree.	Upton.
Dana.	Northborough.	Uxbridge.
Douglas.	Northbridge.	Warren.
Dudley.	North Brookfield.	Webster.
East Brookfield.	Oakham.	West Boylston.
Fitchburg.	Oxford.	West Brookfield.
Gardner.	Paxton.	Westborough.
Grafton.	Petersham.	Westminster.
Hardwick.	Phillipston.	Winchendon.
Harvard.	Princeton.	Worcester — 60.
Holden.		

Dr. Francis A. Finnegan, 614 Park Building, Worcester, *State District Health Officer.*

Mrs. Anna Hartnett, *Nursing Assistant.*

Miss Katherine B. O'Connor, *Nursing Assistant.*

The Connecticut Valley District — No. 6.

Agawam.	Hadley.	Shutesbury.
Amherst.	Hampden.	Southampton.
Belchertown.	Hatfield.	South Hadley.
Blandford.	Holland.	Southwick.
Brimfield.	Holyoke.	Springfield.
Chesterfield.	Huntington.	Sunderland.
Chicopee.	Leverett.	Tolland.
Conway.	Longmeadow.	Wales.
Deerfield.	Ludlow.	Ware.
Easthampton.	Monson.	West Springfield.
East Longmeadow.	Montgomery.	Westfield.
Enfield.	Northampton.	Westhampton.
Goshen.	Palmer.	Whately.
Granby.	Pelham.	Wilbraham.
Granville.	Prescott.	Williamsburg — 47.
Greenwich.	Russell.	

Dr. Harold E. Miner, 289 Main Street, Springfield, *State District Health Officer.*
Miss Mary E. Ayer, *Nursing Assistant.*

The Berkshire District — No. 7.

Adams.	Hancock.	Otis.
Alford.	Hawley.	Peru.
Ashfield.	Heath.	Pittsfield.
Becket.	Hinsdale.	Plainfield.
Bernardston.	Lanesborough.	Richmond.
Buckland.	Lee.	Rowe.
Charlemont.	Lenox.	Sandisfield.
Cheshire.	Leyden.	Savoy.
Chester.	Middlefield.	Sheffield.
Clarksburg.	Monroe.	Shelburne.
Colrain.	Montague.	Stockbridge.
Cummington.	Monterey.	Tyringham.
Dalton.	Mount Washington.	Warwick.
Egremont.	New Ashford.	Washington.
Erving.	New Marlborough.	Wendell.
Florida.	New Salem.	West Stockbridge.
Gill.	North Adams.	Williamstown.
Great Barrington.	Northfield.	Windsor.
Greenfield.	Orange.	Worthington — 57.

Dr. Oscar A. Dudley, Box 1036, Pittsfield, *State District Health Officer.*
Miss Katharine M. Turner, *Nursing Assistant.*

Work of Engineering Division.

Work coming under this head has consisted largely in taking samples of water from springs and wells, and submitting a report of the surroundings, at the request of the Division of Sanitary Engineering, more especially at points distant from the State House, where the doing of the work resulted in a substantial saving of time and expense.

REPORT OF THE WORK OF THE BACTERIOLOGICAL LABORATORY.

During the year ended Nov. 30, 1920, the Bacteriological Laboratory has examined 28,637 specimens. Table 1 shows the number and kinds of examinations. A comparison is made between the years 1915 and 1920.

Table 1.

	1915.	1920.
Diphtheria,	10,528	18,046
Tuberculosis,	2,794	4,341
Widal test,	2,248	1,533
Typhoid culture,	375	908
Gonorrhea,	1,076	2,775
Malaria,	58	82
Miscellaneous,	110	952[1]
	17,189	28,637

[1] Including 545 pneumococcus type determinations; 34 diphtheria virulence tests; 49 animal inoculations for tubercle bacilli; 78 paratyphoid A and B; 15 anthrax (animal tests).

Table 2 shows the results of examinations: —

Table 2.

	Positive.	Negative.	*Atypical.	Total.
Diphtheria (primary),	1,477	10,418		11,895
Diphtheria (release),	1,770	4,381		6,151
Tuberculosis,	1,013	3,328		4,341
*Typhoid fever (Widal test),	363	1,087	83	1,533
Typhoid fever (culture test),	51	857		908
Gonorrhea,	292	2,483		2,775
Malaria,	1	81		82
Miscellaneous,	–	–		952
Total,	–	–	–	28,637

Diphtheria.

The culturing of school children in infected schools has been carried on throughout the year to a limited extent, 5,053 cultures being examined. Twenty-four carriers were found among this number. This

work might be increased without overburdening the laboratory. Careful investigation of the carriers would add greatly to the value of the work.

Typhoid Fever.

Although the number of Widal tests made was less than usual, examinations of specimens of fæces and urine for typhoid bacilli were greatly increased, totaling 908. Four carriers were discovered. None of these handled food for sale but were apparently responsible for cases in their households.

Pneumococcus Type Determination.

There were 545 specimens of sputum examined for pneumococcus type. The results follow: —

	Specimens.	Per Cent.
Type I,	40	11.4
Type II,	56	16.0
Type III,	73	20.9
Group IV,	181	51.7

No pneumococci, 195.

Many of the specimens received were saliva rather than sputum, which probably accounts for the high percentage of Group IV pneumococci.

REPORT OF THE SUBDIVISION OF VENEREAL DISEASES.

The campaign for the control of venereal diseases has made steady progress during the past year.

Statistics.

It does not appear wise to draw any statistical deductions from reports of cases filed since venereal diseases have been reported. Available figures do not appear to support extravagant claims made by some investigators.

The number of cases reported and consequently the reported rate per 100,000 population are declining. The rate per 100,000 for the

year July 1, 1918, to June 30, 1919, was 463; from July 1, 1919, to June 30, 1920, was 316; the yearly rate from July 1, 1920, based on four months' reports, is 283. These figures include only infectious cases, and even for infectious cases are probably distinctly incomplete.

From Jan. 1, 1920, to Dec. 31, 1920, 10,212 cases were reported from 184 cities and towns having a combined population of 3,791,726, thus leaving 170 towns with a combined population of 271,216 from which there were no reports. Granted that a uniform rate of infection obtains throughout the State, and this is a safe assumption, these reporting towns should have returned 730 cases. If all physicians in some towns fail to make proper returns, it is fair to assume that some physicians in every city and town are lax in observing certain legal requirements.

Even allowing for incomplete returns, these figures appear to indicate a lessened rate of infection, and this assumption is supported by statements of physicians in different sections of the State.

Examinations of prisoners confined in Massachusetts penal institutions do not reveal the rate of venereal infections among the prison population indicated in statistics published by observers elsewhere. It is hoped that more accurate figures may be available next year.

Clinics.

The work of the State-approved clinics has increased in numbers of patients treated, and has also improved in other respects not demonstrable by figures: the number of patients has increased; quarterly conferences of clinic directors and clinicians have tended to standardize methods of treatment and procedure in the several clinics; all clinics are apparently providing adequate clinical facilities for their several areas; and changes in hours and personnel have been necessary in some instances to meet the demand for increased service.

In July the clinic at the Salem Hospital was formally approved; in November a clinic organized and equipped by the board of health of Haverhill was approved. In North Adams a civic committee, representing professional, social, mercantile and manufacturing interests, is considering the advisability of establishing and equipping a clinic in that city; a method of procedure has been outlined to the committee.

The clinics at Lynn and Brockton have been reorganized, apparently with benefit to both clinics.

It is difficult to establish any standard as to the amount of work which should be accomplished in any clinic, and equally difficult justly to compare one clinic with another. Attendance at clinics in this State

will be influenced apparently by customs and ideals obtaining in the city under consideration, by the character of the population, whether the people have been educated to seek treatment at out-patient departments, and by the fees demanded by physicians for private treatment. A clinic which apparently may treat few patients in proportion to the population may be rendering to that community valuable service.

Consultation clinics conducted by neurologists for examination of known and suspected cases of neurosyphilis will probably be a reality within a few months. It is intended to refer patients from the State-approved clinics to these consultation clinics, and also to provide like service for the private cases of physicians.

The following figures cover work of the clinics from Dec. 1, 1919, to Dec. 1, 1920: —

	Total New Patients.	Monthly Average of Total Patients.	Total Treatments given.
Attleboro,	32	13.0	306
Boston City,	498	358.0	11,427
Boston Dispensary,	2,421	2,382.9	60,395
Massachusetts General,	2,498	1,706.0	39,350
Massachusetts Homœopathic,	347	285.9	6,881
Brockton,	98	29.7	906
Fall River,	102	80.5	3,914
Fitchburg,	45	11.0	471
Haverhill,[1]	4	–	13
Holyoke,[2]	31	–	100
Lawrence,	118	76.4	1,583
Lowell,	260	106.4	2,737
Lynn,	126	82.5	2,728
New Bedford,	316	208.2	3,043
Pittsfield,	17	5.6	250
Salem,	69	25.6	700
Springfield,	356	171.8	3,032
Worcester,	122	126.6	2,690
	7,460	–	140,526

[1] Clinic opened Nov. 1, 1920.

[2] Clinic opened April, 1920.

Social Service.

Careful studies of the social service needs of the State were made, and a plan for providing such service outlined. Illness necessitated the postponement of these plans.

Through co-operation with the department of penal institutions a follow-up service for reaching families of infected prisoners has been inaugurated. This has not been in operation a sufficient length of time to warrant any statement. A prisoner paroled before the expiration of his sentence must, if infected, present himself regularly at a State clinic for treatment; this condition is written in the parole.

Lapsed Cases.

From Dec. 1, 1919, to Dec. 1, 1920, 1,342 cases were reported by name because they failed to return for treatment, or because other reasons indicated that summary action was advisable. These cases were in turn reported to local boards of health for investigation and necessary action. The majority of these cases were returned for treatment. In a few instances local boards of health reported that aid from police officials was necessary, but in no instance was court action required.

Early in January a new procedure was adopted in reporting lapsed cases to local health authorities to insure routine reporting of those cases only which are actively infectious. In cases of syphilis when three months have elapsed between the date of the numbered report and the report by name, and when four months have elapsed in cases of gonorrhea, a letter is addressed to the attending physician requesting further information. This insures the possibility of giving accurate information to the local health authority.

Arsphenamine.

The number of ampoules of arsphenamine distributed during this year is greater than during 1919. Reports received indicate that the arsphenamine manufactured and distributed by the State compares favorably in its action with commercial products, in fact fewer reactions follow its use. Inquiries indicate that there is a growing demand for the neo-arsphenamine product, and it appears that this should be given careful consideration.

A report issued some months past credited Massachusetts with the use of more arsphenamine per patient than any other State in the Union. If the figures given were correct, it indicates that physicians in this State are conscientiously treating their syphilitic patients.

Advertising.

The posting of signs advertising locations and hours of clinics has been continued during the year. About 13,000 signs have been posted.

Educational.

As the campaign for the control of venereal disease progresses, it becomes increasingly evident that education in its broadest sense offers the most effective weapon. The educational feature to be successful must have the active sympathy and hearty co-operation of practically every individual. Since this is, for the present at least, an impossibility, plans have been devised for interesting organizations and individuals engaged in various phases of welfare work.

The study group feature outlined and perfected in the early fall of last year has been the medium through which women interested in various social activities and organizations engaged in welfare work for young women have received instruction in the problem of venereal disease control. It is hoped that through these study groups wholesome information may be given to those who may not have other opportunities of securing like instruction.

As opportunity has presented, conferences have been held in various cities to discuss local conditions affecting prevalence of venereal disease, and to outline possible procedure for control of the same. These conferences have been attended by health officers, city executives, court officers, nurses, teachers, physicians, social workers, and representatives of social and welfare organizations. At each conference the State program has been carefully outlined, the clinics being especially emphasized. These conferences have served to give a clearer understanding of the venereal disease campaign, and to establish more cordial relations between official and nonofficial agencies and the State clinics.

Industrial.

No great effort has been exerted to launch any comprehensive program through industrial companies. In answer to requests, employers of labor have been interviewed and apprised of measures instituted to control venereal disease. These men expressed sympathy with the program, but thought that active efforts on their part might be misinterpreted by employees.

Meeting of Clinic Directors.

Conferences or meetings of directors and clinicians of the State-approved venereal disease clinics have been held quarterly in January, April, July and October. These meetings have been called to consider and discuss matters of interest relating to clinic management and to care and treatment of patients infected with a venereal disease.

The meetings were as follows: —

January — Neurosyphilis. A clinic was conducted at the Boston Psychopathic Hospital by Dr. H. C. Solomon.
Papers: Dr. Henry J. Perry, Dr. J. Homer Wright, Dr. W. H. Watters, Dr. Townsend W. Thorndike and Hermann C. Lythgoe.
April — Gonorrhea in the Male. Dr. Edward J. Keyes, Jr., New York.
Papers: Hermann C. Lythgoe and Dr. H. C. Solomon.
July — Gonorrhea in the Female. Dr. A. K. Paine and Dr. William P. Graves.
Paper: Dr. William A. Hinton.
October — Congenital Syphilis.
Papers: Dr. W. H. Watters, Dr. C. Morton Smith and Dr. M. C. Smith.

These meetings have been interesting and instructive, and apparently have stimulated the clinicians to exercise their best endeavors toward creating a healthy atmosphere in their several clinics.

Police Departments.

Through co-operation with an agent of the United States Interdepartmental Social Hygiene Board, the animated diagrammatic film "Health and Disease" has been presented to many police departments of the State, and apparently has produced a deep impression. Many police departments have voluntarily promised to restrain incorrigible patients, and promised assistance in locating and restraining vicious sources of infection.

Inspection of Jails and Houses of Correction.

Between April 21 and July 20 every jail and house of correction in the State was visited for the purpose of ascertaining the methods of examining prisoners to determine the presence or absence of venereal infection and modes of treating the same.

Eighteen institutions were visited. The combined population was 1,902 men and 274 women, a total of 2,176, all of whom, with the exception of a few who had just been admitted, had been examined.

The State institutions (Charlestown State Prison, Bridgewater, Concord Reformatory and Sherborn Reformatory) and four of the county jails (Deer Island, East Cambridge, Worcester and Springfield) appear to be well equipped for treating venereal diseases.

Sources of Infection.

Investigations of reported sources of infection during the past year, and facts ascertained therefrom, have proved the wisdom of having such investigations made by workers directly connected with the Department. Some reports appeared to be maliciously made, and others were apparently prompted by jealousy. All persons consulted received the investigator courteously. Many were examined and given treatment when necessary.

Courts.

Personal interviews with courts and court officials, started in September, 1919, were finished late in August, 1920. During this period judges and probation officers of all courts of the State — superior, police and district — were interviewed. The State program for control of venereal diseases was carefully explained, court procedure in cases of actual and suspected sex offences was ascertained, methods of securing examinations in different courts were compared, and uniform procedure in cases suitable for probation was adopted. Thus without any standard legalized process it has been possible to secure thorough co-operation of courts and court officials, a uniform mode of action which promises all that could be secured were the exact procedure legally defined.

Keeping Fit Campaign.

A conference to outline a campaign for Massachusetts was held in the State House December 5. The following organizations were represented: Y. M. C. A., Parent-Teacher Association, Massachusetts Catholic Order of Foresters, State Grange, Salvation Army, Farm Bureau, Red Cross, Knights of Columbus, local health officers. The purposes of the campaign were outlined, the "Keeping Fit" posters were displayed, and the "Keeping Fit" pamphlet for young men was distributed. It was carefully explained that posters or stereopticon slides, or both, would be supplied free by the Massachusetts Department of Public Health to any organization, mercantile or manufacturing company, or to any individual who wished to assist in the campaign and who would make arrangements to have them displayed;

that a balopticon for projecting the stereopticon slides would be loaned if necessary; that speakers could be supplied; that supplies of the "Keeping Fit" pamphlet would be provided.

Organizations represented at this conference rendered valuable assistance during the campaign. Local conferences were held in several cities for the purpose of outlining campaigns for these communities, and in each instance appeared to give the result sought.

Under date of January 26 a letter was addressed to the masters of private schools for boys in the State, asking permission to explain by personal interview the "Keeping Fit" campaign, and, with the permission of the masters, to provide a poster exhibit.

All the private schools (18 in number) for boys of fifteen years and over requested a loan of posters and a supply of pamphlets. Some requested posters for permanent use, and in answer to these requests a set of posters was presented to the school.

All the colleges of the State used the posters either in the gymnasium or as a part of the course in physical culture.

By special request, a set of posters was loaned to a college for women, who expressed great satisfaction with the presentation.

Exhibits were also loaned and pamphlets were supplied to Y. M. C. A., Y. M. H. A., Salvation Army, messenger companies, telegraph companies, News Boys' Union, stores, offices, and to several individuals interested in or having approach to boys. Many sets are in use at present and requests on file indicate that the demand will continue for many months.

The expense of the campaign was approximately as follows: —

Forty sets of posters,	$330 00
Pamphlets,	64 00
Salaries,	780 00
Traveling,	200 00
Express,	10 00
	$1,384 00

The results were as follows: —

Total showings of posters and slides,	192
Total attendance (conservative estimate),	58,507
Pamphlets distributed,	27,383
Cost of reaching one boy,	$0 023

Summary, Dec. 1, 1919, to Dec. 1, 1920.

Reported by number: —		
Gonorrhea,	7,330	
Syphilis,	3,180	
Total,		10,510
Reported by name (lapsed cases),		1,342
Ampoules of arsphenamine distributed,		27,106
Wassermann examinations,		36,910
Smear examinations,[1]		2,798
Pamphlets distributed,		53,027
Lectures,		72
State-approved clinics,		18
New cases admitted to clinics,		7,460
Average monthly attendance at clinics,		5,670.1
Total treatments given,		140,526

PENIKESE HOSPITAL.

The leper hospital at Penikese was transferred from the Department of Public Welfare to the Department of Public Health Dec. 1, 1919, and was then placed in the Division of Communicable Diseases for administrative purposes.

The maximum number of patients treated at Penikese for the year was 17, two of whom were ex-soldiers and cared for under contract with the United States War Risk Insurance Bureau after enabling legislation had been secured. There were 3 deaths during the year and 1 patient deported.

The total appropriation granted for the year was $34,820 and $35,692.67 was expended, a deficit of $872.67 resulting. This deficit was occasioned by the increased cost of food supplies and freight charges, together with labor difficulties. Never before has the institution had such a difficult time to procure and to keep help, and an unusual number of trips to Boston has been necessitated.

The allotment and expenditure of the appropriation were as follows: —

[1] Refers only to smear examinations made in State laboratory. Each clinic examines smears also.

		Allotment, 1920.	Expended, 1920.
Personal services,		$13,400 00	$13,742 12
Travel, transportation and office expenses,		900 00	1,887 88
Food,	$1,156 5,500	6,656 00	6,173 32
Clothing,	$136 600	736 00	723 12
Furnishings and household supplies,		1,200 00	1,354 84
Medical and general care,	$408 1,800	2,208 00	2,076 44
Heat, light and power,		4,000 00	4,358 47
Farm,		4,000 00	3,857 21
Grounds,		50 00	54 52
Repairs, ordinary,		1,670 00	1,464 75
		$34,820 00	$35,692 67

Two of the inmates showed such exceptional improvement under the Chaulmaugra oil treatment that it was thought that it might be possible to parole them with safety to the public. A board of examiners was appointed by the Commissioner to pass upon their condition and to advise the Department as to the feasibility of allowing them to return to community life.

This board consisted of Dr. M. Victor Safford, Dr. Victor G. Heiser, Dr. Townsend Thorndike and Dr. D. Crosby Greene.

Bacteriological examination of smears obtained from scar in the nose showed the presence of lepræ bacilli, and the blood of both patients proved to be faintly positive in the Wassermann test. The board recommended, therefore, their return to the hospital for further treatment.

The inventory submitted is as follows: —

Land and buildings (1919 estimate),	$106,201 83
Personal,	33,515 18
Total,	$139,717 01

The Federal government through the United States Public Health Service has taken definite steps to establish a national leprosarium at Carville, La. The patients now at Penikese will be transferred to this new hospital early in the year. This disposition should prove beneficial both to the patients and to the State.

The splendid service of the superintendent and the older employees who have so faithfully performed their arduous duties warrants special mention. The State has indeed been fortunate in such service and the lot of these unfortunate people made lighter by the thoughtful administration of Dr. Parker and Mrs. Parker.

REPORT OF EPIDEMIOLOGIST.

Epidemiological Significance of Age Distribution in Certain Communicable Diseases.

In 1918 tabulations of all reported cases of communicable disease by age (and by sex) was begun. At once certain important facts, long known to close students of these diseases, became available for use by boards of health and health officers in their propaganda and campaigns to limit the morbidity and mortality from these diseases.

Complete tabulations of death returns by ages are not available for about eighteen months after the end of the year in which they occur. This comes about because, though the Secretary of State's office is willing to and does furnish very promptly each month a total of deaths from each communicable disease, which is approximately correct, it is not willing to sacrifice accuracy in its final tabulations and undertakes many time-consuming verifications which prevent an earlier publication of the complete tabulations of death returns.

At first, therefore, age distributions of deaths and of cases had each to be studied in separate years.

No fair fatality rates by ages could be arrived at, since the cases and deaths for the same year could not be compared. Therefore, it was not until 1920 that we were able to present complete tables on morbidity, mortality and fatality by ages for the same groups of cases. The tables presented, then, are for 1918 and not 1920, since we are now just getting our completed and corrected death tabulations for that year.

Such tables bring out striking and valuable facts as to variations of morbidity, mortality and fatality at different ages. Also, they are valuable standards for epidemiological investigation in that much variation from the State average of incidence by ages would likely be a valuable clue in a particular outbreak.

TABLE 1. — *Measles in Massachusetts, 1918, Cases and Deaths by Ages.*

Age Groups (Years).	Morbidity.					Mortality and Fatality.			
	Number of Reported Cases at Stated Age.	Per Cent of Total Reported Cases at Stated Age.	Number of Cases at Each Age after redistributing the Unknown.	Per Cent of Cases at Each Age based on Column 4.	Per Cent of Cases at less than Stated Age.	Number of Deaths at Stated Age.	Per Cent of Total Deaths at Stated Age.	Per Cent of Total Deaths at less than Stated Age.	Apparent Fatality Rates at Stated Age.
1	2	3	4	5	6	7	8	9	10
Under 1,	736	2.5	789	2.7	–	140	26.4	–	17.8
1,	1,758	6.0	1,928	6.6	2.7	210	39.4	26.4	10.9
2,	2,277	7.8	2,513	8.6	9.3	69	13.0	65.8	2.7
3,	2,337	8.0	2,571	8.8	17.9	36	6.8	78.8	1.4
4,	2,553	8.7	2,804	9.6	26.7	20	3.8	85.6	.7
5,	2,731	9.3	3,009	10.3	36.3			89.4	
6,	3,501	12.0	3,827	13.1	46.6				
7,	2,579	8.9	2,834	9.7	59.7	24	4.5[1]		.2
8,	1,718	5.9	1,899	6.5	69.4				
9,	1,135	3.9	1,256	4.3	75.9				
10 to 14, inclusive,	2,314	7.9[1]	2,542	8.7[1]	80.2	5	.9	93.9	.2
15 to 19, inclusive,	935	3.2	1,023	3.5	88.9	4	.7	94.8	.4
20 to 24, inclusive,	816	2.8	906	3.1	92.4			95.5	
25 to 34, inclusive,	847	2.9	935	3.2	95.5				
35 to 44, inclusive,	236	.8	263	.9	98.7	24	4.5		.1
45 to 54, inclusive,	62	.2	87	.3	99.6				
55 and over,	18	.1	29	.1	99.9				
Unknown,	2,662	9.1	–	–	–	–	–	–	–
Totals,	29,215	100.0	29,215	100.0	100.0	532	100.0	100.0	1.8[2]

[1] This figure for five years. To obtain annual average divide by 5.

[2] It is noted that the fatality rates for 1918 of 1.8 per cent for measles and 9.4 per cent for whooping cough are higher than the median endemic indexes for the period 1911–19 (Table 8), which were 1.3 and 7.6 per cent, respectively. This is thought, in a measure at least, to have been due to influenza. Also, scarcity of physicians in 1918 in many localities probably resulted in poorer reporting than has ordinarily been the case. Furthermore, the classification of deaths from primary and secondary causes given on death certificates has been done since 1916 according to the United States census publication, "Index of Joint Causes of Death." This is now being done by many of the States and is an improvement in that it makes the statistics of the various States more comparable. It is probable that under this system some deaths are credited to measles and whooping cough that formerly would have been credited to causes that were really secondary.

TABLE 2. — *Whooping Cough in Massachusetts, 1918, Cases and Deaths by Ages.*

Age Groups (Years).	Morbidity.					Mortality and Fatality.			
	Number of Reported Cases at Stated Age.	Per Cent of Total Reported Cases at Each Age.	Number of Cases at Each Age after redistributing the Unknown.	Per Cent of Cases at Each Age based on Column 4.	Per Cent of Cases at less than Stated Age.	Number of Reported Deaths at Stated Age.	Per Cent of Total Deaths at Stated Age.	Per Cent of Total Deaths at less than Stated Age.	Apparent Fatality Rates at Stated Age.
1	2	3	4	5	6	7	8	9	10
Under 1,	772	9.9	831	10.7	–	332	45.6	–	40.0
1,	804	10.4	854	11.0	10.7	212	29.1	45.6	24.8
2,	868	11.2	940	12.1	21.7	73	10.0	74.7	7.8
3,	908	11.7	978	12.6	33.8	41	5.6	84.7	4.2
4,	810	10.4	870	11.2	46.4	32	4.4	90.3	3.7
5,	815	10.5	877	11.3	57.6			94.7	
6,	775	10.0	839	10.8	68.9				
7,	520	6.7	559	7.2	79.7	34	4.7[1]		1.2
8,	297	3.8	318	4.1	86.9				
9,	204	2.6	225	2.9	91.0				
10 to 14, inclusive,	266	3.4[1]	287	3.7[1]	93.9	1	.1	99.4	.3
15 to 19, inclusive,	39	.5	47	.6	97.6	–	–	99.5	–
20 to 24, inclusive,	27	.4	31	.4	98.2				
25 to 34, inclusive,	52	.7	54	.7	98.6				
35 to 44, inclusive,	19	.2	23	.3	99.3	4	.5		2.9
45 to 54, inclusive,	16	.2	16	.2	99.6				
55 and over,	16	.2	16	.2	99.8				
Unknown,	557	7.2	–	–	–	–	–	–	–
Totals,	7,765	100.0	7,765	100.0	100.0	729	100.0	100.0	9.4[2]

[1] This figure for five years. To obtain annual average divide by 5. [2] See similar note under measles.

From these tables we find that —

1. Approximately 34 per cent of the whooping cough and 18 per cent of the measles were in children under 3.

2. Eighty-five per cent of the deaths from whooping cough and 79 per cent of those from measles were in children under 3 years.

3. The apparent fatality rates for the group under 3 were $23\frac{1}{2}$ per cent for whooping cough and 8 per cent for measles.

4. For each thousand reported cases of measles there were 18 deaths, and 14 of these were under 3.

5. In the same year each thousand cases of whooping cough represented 92 deaths, and 77 of these were under 3.

6. Even though there was about four times as much measles,

whooping cough mortality leads with 729 deaths, compared with 532 for measles. This is a total of 1,261 deaths from both diseases and 1,036 of these were less than 3 years old.

7. Measuring success by a reduction in deaths from these diseases it is at once apparent that the results depend very largely on how successfully we prevent measles and whooping cough in children under 3, among whom 80 to 85 per cent of the deaths from the two diseases occurred.

8. Propaganda and methods of control should be more specifically directed at this age group.

9. In these years when so many children die of measles and whooping cough or their complications, the most careful medical attention and nursing are needed to prevent dangerous complications.

TABLE 3. — *Diphtheria in Massachusetts, 1918, Cases and Deaths by Ages.*

Age Groups (Years).	Morbidity.					Mortality and Fatality.			
	Number of Reported Cases at Stated Age.	Per Cent of Total Reported Cases at Each Age.	Number of Cases at Each Age after redistributing the Unknown.	Per Cent of Cases at Each Age based on Column 4.	Per Cent of Cases at less than Stated Age.	Number of Reported Deaths at Stated Age.	Per Cent of Total Deaths at Stated Age.	Per Cent of Total Deaths at less than Stated Age.	Apparent Fatality Rates at Stated Age.
1	2	3	4	5	6	7	8	9	10
Under 1,	195	2.8	215	3.1	–	50	8.2	–	23.2
1,	281	4.1	311	4.5	3.1	77	12.7	8.2	24.7
2,	450	6.5	498	7.2	7.6	77	12.7	20.9	15.5
3,	540	7.8	602	8.7	14.8	84	13.8	33.6	14.0
4,	530	7.7	588	8.5	23.5	53	8.7	47.4	9.0
5,	502	7.2	554	8.0	32.0			56.1	
6,	509	7.3	568	8.2	40.0				
7,	447	6.5	498	7.2	48.2	178	29.3		7.7
8,	372	5.4	415	6.0	55.4				
9,	257	3.7	284	4.1	61.4				
10 to 14, inclusive,	850	12.3[1]	935	13.5[1]	65.5	43	7.1[1]	85.4	4.6
15 to 19, inclusive,	347	5.0	381	5.5	79.0	10	1.6	92.5	2.6
20 to 24, inclusive,	399	5.8	443	6.4	84.5			94.1	
25 to 34, inclusive,	330	4.8	367	5.3	90.9				
35 to 44, inclusive,	146	2.1	173	2.5	96.2	36	5.9		2.4
45 to 54, inclusive,	65	.9	69	1.0	98.7				
55 and over,	22	.3	21	.3	99.7				
Unknown,	680	9.8	–	–	–	–	–	–	–
Totals,	6,922	100.0	6,922	100.0	100.0	608	100.0	100.0	8.8

[1] This figure for five years. To obtain annual average divide by 5.

TABLE 4. — *Scarlet Fever in Massachusetts, 1918, Cases and Deaths by Ages.*

Age Groups (Years).	Morbidity.					Mortality and Fatality.			
	Number of Reported Cases at Stated Age.	Per Cent of Total Reported Cases at Each Age.	Number of Cases at Each Age after redistributing the Unknown.	Per Cent of Cases at Each Age based on Column 4.	Per Cent of Cases at less than Stated Age.	Number of Reported Deaths at Stated Age.	Per Cent of Total Deaths at Stated Age.	Per Cent of Total Deaths at less than Stated Age.	Apparent Fatality Rates at Stated Age.
1	2	3	4	5	6	7	8	9	10
Under 1,	31	.7	31	.7	–	2	2.6	–	6.4
1,	89	2.0	99	2.2	.7	12	15.4	2.6	12.1
2,	230	5.1	247	5.5	2.9	8	10.3	18.0	3.2
3,	291	6.5	314	7.0	8.4	5	6.4	28.3	1.5
4,	350	7.8	382	8.5	15.4	16	20.5	34.7	4.2
5,	384	8.6	418	9.3	23.9			55.2	
6,	395	8.8	427	9.5	33.2				
7,	327	7.3	355	7.9	42.7	17	21.8[1]		1.0
8,	261	5.8	283	6.3	50.6				
9,	249	5.5	269	6.0	56.9				
10 to 14, inclusive,	736	16.4[1]	799	17.8[1]	62.9	3	3.8	77.0	.4
15 to 19, inclusive,	296	6.6	323	7.2	80.7	4	5.1	80.8	1.2
20 to 24, inclusive,	191	4.3	207	4.6	87.9			85.9	
25 to 34, inclusive,	230	5.1	251	5.6	92.5				
35 to 44, inclusive,	61	1.3	67	1.5	98.1	11	14.1		2.0
45 to 54, inclusive,	13	.3	13	.3	99.6				
55 and over,	5	.1	5	.1	99.9				
Unknown,	351	7.8	–	–	–	–	–	–	–
Totals,	4,490	100.0	4,490	100.0	100.0	78	100.0	100.0	1.7

[1] This figure for five years. To obtain annual average divide by 5.

Comparing the above two tables with Tables 1 and 2 we find that —

1. Whereas 85 per cent of the total cases of measles were under 12 and of whooping cough under 8, for diphtheria and scarlet fever this percentage occurred under 20 and 18, respectively.

2. Eighty-five per cent of the deaths from measles were in cases under 4 and from whooping cough under 3, whereas from diphtheria and scarlet fever this amount of mortality has not occurred until the ages of 10 and 20, respectively.

3. In other words, in both deaths and cases diphtheria and scarlet fever extended over a wider range of ages.

4. Nevertheless, the highest mortality and fatality, as in measles and whooping cough, came in the early years of life.

TABLE 5. — *Pulmonary Tuberculosis in Massachusetts, 1918, Cases and Deaths by Ages.*

Age Groups (Years).	Morbidity.					Mortality and Fatality.			
	Number of Reported Cases at Stated Age.	Per Cent of Total Reported Cases at Each Age.	Number of Cases at Each Age after redistributing the Unknown.	Per Cent of Cases at Each Age based on Column 4.	Per Cent of Cases at less than Stated Age.	Number of Reported Deaths at Stated Age.	Per Cent of Total Deaths at Stated Age.	Per Cent of Total Deaths at less than Stated Age.	Apparent Fatality Rates at Stated Age.
1	2	3	4	5	6	7	8	9	10
Under 1,	172	2.2	204	2.6	–	54	1.0	–	–
1,						44	.9	1.0	–
2,						14	.3	1.9	66.2
3,						19	.4	2.2	–
4,						4	.1	2.6	–
5 to 9, inclusive,	188	2.4	219	2.8	2.6	34	.7	2.7	15.5
10 to 14, inclusive,	209	2.7	251	3.2	5.4	80	1.5	3.4	31.9
15 to 19, inclusive,	485	6.2	572	7.3	8.6	366	7.1	4.9	64.0
20 to 29, inclusive,	1,979	25.2	2,342	29.9	15.9	1,431	27.6	12.0	61.1
30 to 39, inclusive,	1,596	20.4	1,888	24.1	45.8	1,280	24.7	39.6	67.8
40 to 49, inclusive,	1,047	13.4	1,237	15.8	69.9	895	17.3	64.3	72.3
50 to 59, inclusive,	597	7.6	705	9.0	85.7	559	10.8	81.6	79.3
60 to 69, inclusive,	249	3.2	298	3.8	94.7	275	5.3	92.4	92.3
70 and over,	103	1.3	117	1.5	98.5	121	2.3	97.7	103.4
Unknown,	1,208	15.4	–	–	–	1	–	–	–
Totals,	7,833	100.0	7,833	100.0	100.0	5,177	100.0	100.0	66.1

TABLE 6. — *Tuberculosis, Other Forms, in Massachusetts, 1918, Cases and Deaths by Ages.*

Age Groups (Years).	Morbidity.					Mortality and Fatality.			
	Number of Reported Cases at Stated Age.	Per Cent of Total Reported Cases at Each Age.	Number of Cases at Each Age after redistributing the Unknown.	Per Cent of Cases at Each Age based on column 4.	Per Cent of Cases at less than Stated Age.	Number of Reported Deaths at Stated Age.	Per Cent of Total Deaths at Stated Age.	Per Cent of Total Deaths at less than Stated Age.	Apparent Fatality Rates at Stated Age.[1]
1	2	3	4	5	6	7	8	9	10
Under 1,	57	7.6	63	8.4	–	98	12.4	–	155.5
1,	66	8.8	73	9.7	8.4	100	12.6	12.4	137.0
2,	36	4.8	39	5.3	18.1	52	6.6	25.0	133.3
3,	33	4.4	36	4.8	23.4	54	6.8	31.6	150.0
4,	40	5.4	44	5.9	28.2	29	3.7	38.4	65.9
5 to 9, inclusive,	97	13.0	106	14.2	34.1	71	9.0	42.1	67.0
10 to 14, inclusive,	41	5.5	45	6.0	48.3	34	4.3	51.1	75.5
15 to 19, inclusive,	49	6.6	54	7.2	54.3	39	4.9	55.4	72.2
20 to 29, inclusive,	111	14.9	122	16.3	61.5	36	10.9	60.3	70.5
30 to 39, inclusive,	72	9.6	78	10.5	77.8	78	9.8	71.2	100.0
40 to 49, inclusive,	52	7.0	57	7.6	88.3	65	8.2	81.0	114.0
50 to 59, inclusive,	15	2.0	16	2.2	95.9	47	5.9	89.2	293.7
60 to 69, inclusive,	10	1.3	11	1.5	98.1	23	2.9	95.1	209.1
70 and over,	3	.4	3	.4	99.6	16	2.0	98.0	533.3
Unknown,	65	8.7	–	–	–	–	–	–	–
Totals,	747	100.0	747	100.0	100.0	792	100.0	100.0	106.0

[1] Indicates poor reporting.

These tables show that —

1. Pulmonary tuberculosis is a disease of adult life, 54 per cent of the cases and 52 per cent of the deaths in 1918 being in the group 20–39, inclusive.

2. Pulmonary tuberculosis is not particularly a disease of childhood, only 8.6 per cent of the cases and 7.1 per cent of the deaths being under 15.

3. Tuberculosis, other than pulmonary, is a disease of childhood, 54 per cent of the cases and 55 per cent of the deaths being under 15.

The fatality rate for tuberculosis, other than pulmonary, indicates bad reporting. However, there is no reason to believe that the unreported cases are distributed by ages differently from those reported.

Sex Distribution of Communicable Diseases.

Table 7 is included so that Health Officers and others interested in the investigation of epidemics may have data upon which to base tables for normal incidence of these diseases by sex. Given a standard sex distribution, any marked variation therefrom would probably be of epidemiological significance.

It is noted that in 1919 more females than males had diphtheria after twenty years of age and that for all ages more males than females suffered from pulmonary tuberculosis. Figures for 1918 show the same in both cases. The total number of cases of pulmonary tuberculosis for 1918 was 7,833, and of these cases 4,565 were males, 3,167 females and 101 of unknown sex. Also, in adult life in 1918, more cases of diphtheria occurred in females than in males.

Table 7. — *Cases of Certain Communicable Diseases, 1919, by Sex and Age.*

Age Groups (Years).	Whooping Cough.			Measles.			Diphtheria.			Pulmonary Tuberculosis.		
	Male.	Female.	Unknown.	Male.	Female.	Unknown.	Male.	Female.	Unknown.	Male.	Female.	Unknown.
1	2	3	4	5	6	7	8	9	10	11	12	13
Under 1,	278	263	8	172	144	15	87	53	5			
1,	264	252	9	315	298	20	161	106	–			
2,	251	300	15	374	343	28	251	203	4	82	59	1
3,	315	313	12	417	404	32	289	284	5			
4,	279	250	8	445	442	26	305	295	4			
5,	298	297	9	551	520	30	364	300	8			
6,	327	309	4	682	652	22	317	335	2			
7,	216	234	4	506	509	17	290	303	3	84	107	–
8,	112	134	3	337	340	11	244	269	–			
9,	76	64	3	201	165	7	198	223	1			
10 to 14, inclusive,	100	103	1	318	338	6	531	609	5	109	161	3
15 to 19, inclusive,	10	10	–	80	97	3	142	169	2	211	286	4
20 to 24, inclusive,	15	12	–	55	68	1	74	178	–	388	479	2
25 to 34, inclusive,	8	19	–	37	72	2	103	231	3	883	745	10
35 to 44, inclusive,	3	10	–	22	22	–	48	109	1	721	483	1
45 to 54, inclusive,	2	4	–	8	8	–	25	37	–	527	224	4
55 and over,	6	6	–	1	5	–	11	26	–	371	176	4
Unknown,	165	166	180	326	239	252	342	333	41	447	378	27
Totals,	2,725	2,746	256	4,847	4,666	472	3,782	4,063	84	3,823	3,098	56

Outbreaks of Communicable Diseases in 1920.

Communicable diseases reached sufficient proportions to call for special investigation and special report to the central office by the District Health Officers in over fifty instances. Besides this, watch was kept on those diseases that were generally and widely prevalent.

1. *Anterior Poliomyelitis.*

Beginning about the middle of July and lasting until December an outbreak of this disease, totaling about 700 cases, took place in eastern and northeastern Massachusetts. Locations and dates of onsets of the first 23 reported cases were as follows: —

June 30, Manchester.
July 2, Dedham.
July 9, Rutland.
July 9, Boston.
July 11, Lawrence.
July 13, Boston.
July 14, Boston.
July 14, Lawrence.
July 16, Boston.
July 20, Malden.
July 20, Boston.
July 21, Boston.
July 22, Boston.
July 22, Chelsea.
July 23, Boston.
July 25, Boston (two).
July 26, Somerville.
July 27, Boston.
July 30, Boston.
July 24, [1] Medfield.
July 24, [1] East Weymouth.
August 4, [1] Scituate.

By the end of July, twelve foci of infection existed. One focus had furnished 12 of the first 23 cases and the other eleven foci furnished 1 case each. Whether the disease had smouldered in the largest focus before cases were reported and had spread from unrecognized cases in this focus, or had originated from one of the smaller foci, is a question.

The outbreak confined itself to eastern and northeastern Massachusetts and spread slowly from the metropolitan cities into the northeastern cities and towns. The incidence by months, as compared with 1916, was as follows: —

	1920.	1916.
To July 1,	16	30
July,	16	106
August,	93	252
September,	273	623
October,	190	701
November,	77	179
December,	31	36
Totals,	696	1,927

[1] Date of report; date of onset not available.

A weekly record of reports showed an incidence very closely following the seasonal distribution in 1916. The peak for reported cases was reached in both years in the week of October 2.

Dr. Lyon and Dr. Hassman, who were supplied from the staff of the Harvard Infantile Paralysis Commission to do early diagnostic consultation work, saw 57 cases (Dr. Lyon, 49; Dr. Hassman, 8). Diagnosis was based on study of the cell content of spinal fluid as well as clinical symptoms. The cases seen were classified as follows: —

	Cases.	Punctures.
Late paralytic,	8	None
Early paralytic,	15	8
Preparalytic,	10	10
Not poliomyelitis,	22	8
Not diagnosed,	2	2

The early cases were those that when seen either showed very slight paralysis that had escaped the attention of the physician or were cases that had developed some paralysis in the interim since they were last seen. The total number of cases seen was so small that it will be possible to draw inferences and not conclusions from the study. Of the 10 cases diagnosed before there was any paralysis at all, 8 have been reported on and 3 were found to have subsequently developed paralysis.

2. *Influenza.*

(*a*) *Chronology.* — The arrival of the 1920 epidemic was noted on January 20, when 64 cases were reported to the Department, whereas the total for the previous week was only 58 cases. For comparison, on January 27, 482 cases were reported, and on February 2, 1,076 cases. Because of the allied character of the diseases, lobar pneumonia (the only form of pneumonia reportable in Massachusetts) statistics also are given.

Following the practice of 1918, educational measures were at once instituted by means of moving pictures, slides, newspapers and lectures to warn the public, but what effect was thereby produced on the progress of the disease it is impossible to say.

Cases were first reported in and around Boston, and rapidly increased, the height of the epidemic being reached sixteen days later on February 4, 5 and 6. Although the peak as shown by case reports was on February 9, 10 and 11, this false peak was caused by the delay in mails due to the heavy snowstorm of February 5, 6 and 7, and does not represent the true peak of the disease.

The epidemic ran a ten-week course, — shorter than the 1918–19 epidemic of six to seven months, — and was similar to that experienced elsewhere in the country. January 20 to March 31, inclusive, was the correct duration.

Lobar pneumonia cases showed an immediate increase with influenza cases, and paralleled the curve of that disease.

(*b*) *Age Distribution.* — The age distribution of the influenza cases of the 1920 epidemic was similar to that of the previous one, the larger number of cases being in the age groups of 0 to 4 and 25 to 34 years. The 5 to 14 year age group suffered the least.

Case Incidence at Different Ages.

Ages (Years).	Per Cent of Total Cases.	Ages (Years).	Per Cent of Total Cases.
0 to 4,	10.0	35 to 44,	14.7
5 to 14,	12.0	45 to 54,	9.4
15 to 24,	19.4	55 to 64,	3.7
25 to 34,	27.9	65 and over,	2.9

(*c*) *Sexes.* — As in previous epidemics the incidence in males exceeded that in females, the figures being 51 and 49 per cent, respectively. The age groups of the sexes showed that up to twenty-five years there were more cases among females, but after that age the majority of the cases were males. The mortality statistics are not yet complete for the age groupings.

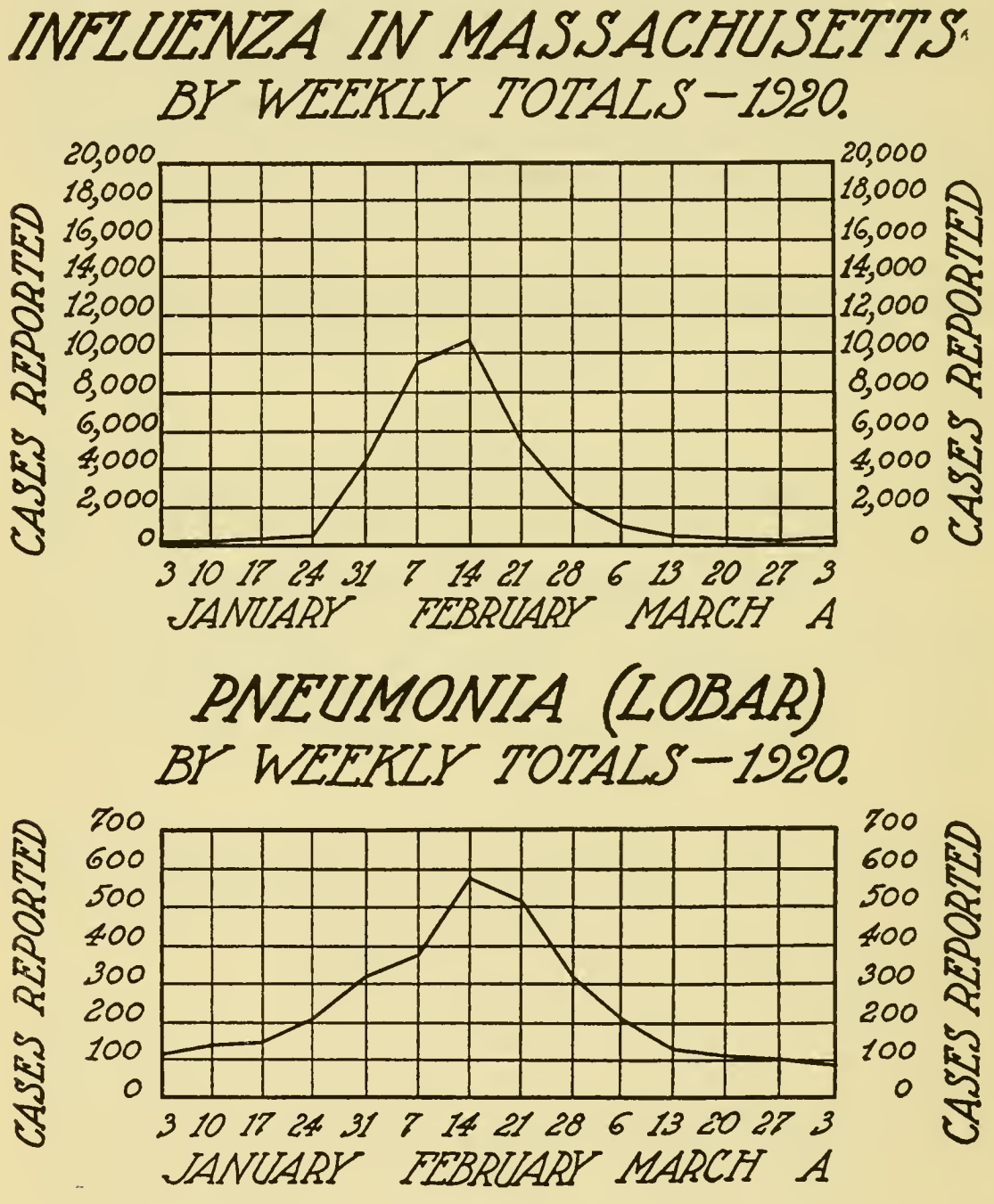
(*d*) *Virulence.* — In 1918–19 the fatality rate was 7.6 per cent, whereas this year there is a rate of 4.68 per cent, judging from death statistics. There is a great source of error in the fatality rate of influenza because of the many mild cases that are not reported, which would tend to lower the fatality rate considerably.

(*e*) *Immunity.* — The fact that the morbidity rate was much less in 1920 than 1918–19 suggests that there may be a definite immunity conferred by the disease or a great decrease in the virulence of the causative organism. Possibly both of these factors played a part.

(*f*) *Morbidity, Mortality and Fatality.* — From Oct. 1, 1918, to April 30, 1919, inclusive, there were 184,419 cases of influenza reported and 13,419 deaths, giving a fatality rate of 7.3 per cent. In September, 1918, there were 2,939 deaths, making a total of 16,358 deaths in Massachusetts during the epidemic from Sept. 1, 1918, to April 30, 1919.

In the present epidemic there were 35,633 cases from Jan. 1, 1920, to March 31, 1920, and incomplete records give 1,660 deaths, making a fatality rate of 4.65 per cent.

Obviously, the fatality rates for both epidemics are much too high because of the non-reporting of the milder cases of influenza. A rate of 3 to 5 per cent for 1918 and of less than 1 per cent for 1920 would, perhaps, be nearer the true fatality rates of these two epidemics.



3. *Measles.*

A State-wide epidemic prevailed during the first seven months of 1920. For the entire year 32,141 cases were reported, the largest number ever known. Seventeen separate outbreaks were investigated, which were found to have been due to school, family and neighborhood contact before quarantine was instituted. Large numbers of

missed mild cases and late diagnoses made control particularly difficult. The disease became so prevalent that all individual outbreaks could not be investigated and resort had to be had to general advice.

4. *Whooping Cough.*

The beginning of the year saw also a widespread and well-developed outbreak of this disease throughout the State. It, too, with about 10,000 reported cases, exceeded all past records of incidence.

Health officials should acquaint themselves accurately with the years of greatest mortality and fatality (Tables 1 and 2) for both whooping cough and measles; and should preach unceasingly to parents the duty of deferring as long as possible the evil day when their children may contract these diseases.

5. *Diphtheria.*

In 1920 there were about 7,500 reported cases, an incidence little different from previous years.

Twenty-four outbreaks that occurred were investigated. Of these, six, or 25 per cent, were second outbreaks in the same towns. This is food for thought.

In one instance a case in the first outbreak that had been released from quarantine by culture became a carrier and caused the second outbreak. Might not released cases of diphtheria be cultured several times at definite intervals after release from quarantine, as a routine measure, to discover whether they have become intermittent carriers? This would protect both the immediate family and the public. The rule might at least apply to school children. Might not health officials on the occurrence of undue incidence of diphtheria at once, as a routine, re-culture all cases that have occurred within the past six months, especially the ones at all likely to be associated with the current cases?

In one instance the second outbreak came because a milker with diphtheria, excluded from a dairy farm on the advice of the State Department, had been allowed to return without release cultures. In the four other instances the lax quarantines practiced, the undiscovered mild cases, the practice of releasing from quarantine without cultures in some instances were still found to prevail.

6. *Scarlet Fever.*

There were sixteen outbreaks that required investigation by the District Health Officers. With about 10,000 cases reported, the incidence exceeded any since 1914. The total deaths also exceeded those of any year since 1914.

7. *Septic Sore Throat.*

But one real outbreak of this disease occurred. It was milk-borne and involved 43 cases on the same route. In searching for the cause of this outbreak several cows were found to be suffering from garget. Cultures were taken from the udders and from the milk of these cows and also from the throats of all the milk handlers. The returns from these first cultures showed streptococci from the garget in the cows but none from the milk handlers. The streptococci isolated from the cows were non-hemolytic, whereas all organisms that had been isolated from the cases were distinctly of the hemolytic type. A second trip was made to that town and all the milkers recultured, and in one milker's throat was found a hemolytic streptococcus. It is believed that he and not the cows caused the outbreak.

8. *Typhoid Fever.*

The 1920 record for typhoid excels the remarkable record made in 1919. The following outbreaks occurred: —

Place.	Number of Cases.	Time.	History.
Chelsea,	18	July,	Milk-borne epidemic. Unpasteurized supply. A one-dairy route. No outside help. Carrier not found after a number of examinations.
Taunton,	8	July and August,	In State hospital for insane. Thought to have been due to a supposed carrier, who absconded when it began to appear that she was the cause of the cases. Suspected carrier, an attendant.
Warner, N. H.,	9	August,	Vacationists, mostly teachers, at a summer boarding house returned to Massachusetts and developed typhoid shortly afterwards in Boston, Worcester, Waltham, Somerville and Stoneham. The secretary of the New Hampshire Board of Health reports that the outbreak involved cases from Rhode Island and New Hampshire also, and was probably due to a mild case of typhoid in the kitchen help.
Ipswich,	33	September,	Milk; three milk handlers involved. One suspected of being carrier. Suspicion not yet confirmed.
Fall River,	34	September,	Polluted well in one of the large mills.
Northampton,	15	Dec., 1917, to Feb., 1920.	Two attendants who left the hospital about Jan. 1, 1920, suspected of being carriers. One had typhoid history. Suspicions were not confirmed.
New Bedford,	29	August and September.	No cause could be found.

In four of the six outbreaks tabulated, carriers were suspected but not proved. This is illustrative of the difficulty and large amount of work often necessary to detect carriers and of the disappointments frequently in store for us. However, as the amount of typhoid in Massachusetts has year by year grown less, our efforts can now be more intensive. Furthermore, we now begin such investigations with the knowledge that it will likely require great numbers of cultures to detect the carrier, especially if he be of the intermittent type.

Progress made in Past Five-year Period.

Tables 8 to 17 have been prepared for purposes of comparison with past years. Included in each table, except Table 13, are median rates for the nine-year period 1911–19, inclusive, and underneath these figures come the 1920 figures which are readily compared with them.

Table 8. — *Case, Death and Fatality Rates for Measles and Whooping Cough, 1911–20, inclusive.*

Year.	Population based on State and Federal Censuses.	Measles.[1]					Whooping Cough.[1,2]				
		Cases.	Cases per 100,000.	Deaths.	Deaths per 100,000.	Fatality Rates.	Cases.	Cases per 100,000.	Deaths.	Deaths per 100,000.	Fatality Rates.
1	2	3	4	5	6	7	8	9	10	11	12
1911, . .	3,445,416	16,094	467.1	158	4.6	1.0	3,911	113.5	292	8.5	7.5
1912, . .	3,510,795	22,423	638.7	286	8.2	1.3	2,112	88.6	225	6.4	7.2
1913, . .	3,576,174	29,192	816.3	315	8.8	1.1	3,325	93.0	239	6.7	7.2
1914, . .	3,641,553	12,264	336.8	149	4.1	1.2	3,316	91.1	225	6.2	6.8
1915, . .	3,706,931	22,881	617.2	149	4.0	.6	7,182	193.7	283	7.6	3.9
1916, . .	3,739,364	25,460	680.9	392	10.5	1.5	6,447	172.5	346	9.2	5.4
1917, . .	3,771,797	23,880	633.1	371	9.8	1.6	3,877	102.8	243	6.4	6.3
1918, . .	3,804,231	29,215	768.0	532	14.0	1.8	7,765	204.1	729	19.2	9.4
1919, . .	3,836,664	9,985	260.2	183	4.8	1.8	5,727	149.3	319	8.3	5.6
Median Rates.											
1911–19, .	–	23,880	633.1	286	8.2	1.3	3,911	113.5	283	7.6	6.8
1920, . .	3,869,098	32,141	830.7	347	9.0	1.1	9,994	258.3	542	14.0	5.4

[1] Made reportable in 1893. [2] Made reportable in 1907.

Both measles and whooping cough show greater mortality rates in the five-year period 1916–20 than in the period 1911–15. See

Tables 13*a* and *b*, which are based on Tables 8 to 17. As has been said before, most of this increase for measles and whooping cough is due to change in classification of deaths which occurred in 1916 (see the note under Table 1). This is very definitely proved in Table 13*b* which is the same as Table 13*a*, except that it is based on the United States Census Mortality Reports for all years except 1920. The difference between State and Federal figures comes through different methods of classifying primary and secondary causes of deaths. The same death certificates were used by both, the United States census data being taken from transcripts of original certificates. About 1916 or 1917 the State figures began to be based on classification according to the United States census publication, "Index of Joint Causes of Death." Since that time the figures from the two sources have more nearly approximated and are now practically uniform for these two diseases.

TABLE 9. — *Case, Death and Fatality Rates for Diphtheria and Scarlet Fever, 1911–20, inclusive.*

YEAR.	Population based on State and Federal Censuses.	DIPHTHERIA.[1]					SCARLET FEVER.[1]				
		Cases.	Cases per 100,000.	Deaths.	Deaths per 100,000.	Fatality Rates.	Cases.	Cases per 100,000.	Deaths.	Deaths per 100,000.	Fatality Rates.
1	2	3	4	5	6	7	8	9	10	11	12
1911, . .	3,445,416	6,998	203.1	563	16.3	8.1	6,173	179.1	184	5.3	3.0
1912, . .	3,510,795	5,433	154.8	473	13.5	8.7	5,633	160.4	118	3.4	2.1
1913, . .	3,576,174	6,741	188.5	628	17.6	9.3	8,062	225.4	293	8.2	3.6
1914, . .	3,641,553	8,080	221.9	652	17.9	8.1	11,057	303.7	246	6.8	2.2
1915, . .	3,706,931	9,282	250.4	721	19.4	7.8	8,613	232.3	182	4.9	2.1
1916, . .	3,739,364	7,282	194.7	629	16.8	8.6	6,271	167.7	127	3.4	2.0
1917, . .	3,771,797	10,322	273.7	838	22.2	8.1	5,953	157.8	120	3.2	2.0
1918, . .	3,804,231	6,922	181.9	608	15.9	8.8	4,490	118.0	78	2.0	1.7
1919, . .	3,836,664	7,929	206.6	591	15.4	7.5	8,018	209.0	130	3.4	1.6
Median Rates.											
1911–19, .	–	6,998	203.1	629	16.8	8.1	6,173	179.1	130	3.4	2.1
1920, . .	3,869,098	7,513	194.2	595	15.4	7.9	10,260	265.2	215	5.5	2.1

[1] Made reportable in 1884.

Diphtheria shows a mortality rate of 17.0 for the period 1911–15 and of 17.1 for the period 1916–20 (see Table 13*a*). This is par-

ticularly discouraging in view of the increased efforts that have been put forth by the State Department through educational matter and through the District Health Officers. However, if we consider Table 13*b*, based mainly on Federal figures the showing is better, viz., 17.3 for 1911–15 and 16.9 for 1916–20.

The epidemiologist comes into close touch with outbreaks of disease, and reference is again made to the 1920 outbreak of diphtheria.

Scarlet fever has decidedly decreased in mortality in the last five years.

TABLE 10. — *Case, Death and Fatality Rates for Cerebrospinal Meningitis and Anterior Poliomyelitis, 1911–1920, inclusive.*

Year.	Population based on State and Federal Censuses.	Cerebrospinal Meningitis.[1]					Anterior Poliomyelitis.[2]				
		Cases.	Cases per 100,000.	Deaths.	Deaths per 100,000.	Fatality Rates.	Cases.	Cases per 100,000.	Deaths.	Deaths per 100,000.	Fatality Rates.
1	2	3	4	5	6	7	8	9	10	11	12
1911, . .	3,445,416	150	4.4	143	4.1	95.4	232	6.7	36	1.0	15.5
1912, . .	3,510,795	202	5.8	138	3.9	68.4	169	4.8	76	2.2	45.0
1913, . .	3,576,174	180	5.0	147	4.1	81.7	361	10.1	69	1.9	19.1
1914, . .	3,641,553	181	5.0	156	4.3	86.3	151	4.1	45	1.2	29.8
1915, . .	3,706,931	145	3.9	125	3.4	86.3	135	3.6	32	.9	23.7
1916, . .	3,739,364	150	4.0	136	3.6	90.5	1,927	51.5	452	12.1	23.4
1917, . .	3,771,797	196	5.2	168	4.4	85.7	174	4.6	51	1.3	29.3
1918, . .	3,804,231	378	9.9	231	6.1	61.1	99	2.6	37	1.0	37.4
1919, . .	3,836,664	253	6.6	181	4.7	71.5	66	1.7	17	.4	25.8
					Median Rates.						
1911–1919, .	–	181	5.0	147	4.1	86.3	174	4.6	45	1.2	25.8
1920, . .	3,869,098	182	4.7	129	3.3	70.8	696	18.0	140	3.6	20.1

[1] Made reportable in 1893. [2] Made reportable in 1909.

Both infantile paralysis and cerebrospinal meningitis showed increased mortality in the last five-year period. In infantile paralysis work our lack of knowledge of the mode of spread hinders us.

In the case of cerebrospinal meningitis there are several considerations. The disease is often rapidly fatal. A death report is frequently the first information that a local board has. Many deaths are so reported which may be due to other things, as tuberculous meningitis. Spinal punctures are often not made. Our statistics on this disease are not, therefore, of the best.

TABLE 11. — *Case, Death and Fatality Rates for All Forms of Tuberculosis, 1911–1920, inclusive.*

YEAR.	Population based on State and Federal Censuses.	PULMONARY.[1]					OTHER FORMS.[1]				
		Cases.	Cases per 100,000.	Deaths.	Deaths per 100,000.	Fatality Rates.	Cases.	Cases per 100,000.	Deaths.	Deaths per 100,000.	Fatality Rates.
1	2	3	4	5	6	7	8	9	10	11	12
1911, . .	3,445,416	7,031	204.1	4,418	128.2	62.8	–[1]	–[1]	–[1]	–[1]	–[1]
1912, . .	3,510,795	7,519	214.2	4,212	119.9	56.0	447	13.6	855	24.4	179.2
1913, . .	3,576,174	7,424	207.6	4,180	116.9	56.4	412	11.5	869	24.6	210.9
1914, . .	3,641,553	7,144	196.2	4,171	114.5	58.3	570	15.7	890	24.4	156.1
1915, . .	3,706,931	8,046	217.0	4,194	113.2	52.2	822	22.2	853	23.0	103.9
1916, . .	3,739,364	7,878	210.7	4,467	119.4	56.5	657	17.6	955	25.6	145.5
1917, . .	3,771,797	8,365	221.8	4,651	123.3	55.5	776	20.6	758	20.1	97.6
1918, . .	3,804,231	7,833	205.9	5,177	136.1	66.1	747	19.6	792	20.8	106.0
1919, . .	3,836,664	6,977	181.8	4,200	109.5	60.2	782	20.4	694	18.1	88.7
Median Rates.											
1911–1919, .	–	7,424	207.6	4,467	119.4	56.5	747	19.6	855	24.4	145.5
1920, . .	3,869,098	6,696	173.1	3,743	96.7	55.8	800	20.7	639	16.5	79.9

[1] All forms of tuberculosis were made reportable in 1907, but reporting of other forms than pulmonary was very incomplete before 1912.

Table 13*a* shows some decrease in the mortality from all forms of tuberculosis. The decrease for the pulmonary form was from a rate of 118.4 for 1911–1915 to 117.5 for 1916–1920. Federal figures (Table 13*b*) are more favorable, being 116.9 and 115.8, respectively.

Table 11 shows a decidedly decreased mortality for 1919 and 1920, the figures being 109.5 and 96.7, respectively.

TABLE 12. — *Case, Death and Fatality Rates for Typhoid Fever,*[1] *1911–1920, inclusive.*

YEAR.	Population based on State and Federal Censuses.	Cases.	Cases per 100,000.	Deaths.	Deaths per 100,000.	Fatality Rates.
1	2	3	4	5	6	7
1911,	3,445,416	2,238	64.9	302	8.8	13.5
1912,	3,510,795	2,088	59.5	269	7.7	12.9
1913,	3,576,174	2,398	67.0	280	7.8	11.7
1914,	3,641,553	2,333	64.1	268	7.4	11.5
1915,	3,706,931	2,204	59.5	246	6.6	11.2
1916,	3,739,364	1,515	40.5	172	4.6	11.3
1917,	3,771,797	1,546	41.0	178	4.7	11.5
1918,	3,804,231	1,067	28.0	160	4.2	15.0
1919,	3,836,664	940	24.5	103	2.7	10.9
Median Rates.						
1911–1919,	–	2,088	59.5	246	6.6	11.5
1920,	3,869,098	935	24.2	96	2.5	10.3

[1] Made reportable in 1893.

Steady progress has been made in typhoid fever work. The mortality has been reduced from 7.6 for the period 1911–1915 to 3.7 for 1916–1920. In 1919 and 1920 the remarkable low records of 2.7 and 2.5 deaths per 100,000 were made.

Being a disease involving a small number of cases as compared with such diseases as measles, whooping cough, diphtheria and scarlet fever, it has been possible for the Department to do intensive work on typhoid. For many years all cases on milk farms and nearly all other cases have been personally investigated by the District Health Officers. The main factor in the decrease, perhaps, has been the increasing improvement in sanitation and water supplies of towns and cities.

TABLE 13*a*. — *Mortality Rates for Certain Communicable Diseases in Massachusetts for the Five-year Periods, 1911–1915, inclusive, and 1916–1920, inclusive.*

PERIODS.	Total Populations.	MEASLES.		WHOOPING COUGH.		DIPHTHERIA.		SCARLET FEVER.		CEREBROSPINAL MENINGITIS.		ANTERIOR POLIOMYELITIS.		PULMONARY TUBERCULOSIS.		TYPHOID FEVER.	
		Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.
1911–1915, . .	17,880,869	1,057	5.9	1,264	7.1	3,037	17.0	1,023	5.7	709	4.0	258	1.4	21,175	118.4	1,365	7.6
1916–1920, . .	19,021,154	1,845	9.7	2,187	11.5	3,247	17.1	666	3.5	848	4.4	703	3.7	22,359	117.5	710	3.7

TABLE 13*b*. — *Mortality Rates for Certain Communicable Diseases in Massachusetts for the Five-year Periods, 1911–1915, inclusive, and 1916–1920, inclusive.*

[Based on United States Census Mortality Reports.]

PERIODS.	Total Populations.	MEASLES.		WHOOPING COUGH.		DIPHTHERIA.		SCARLET FEVER.		CEREBROSPINAL MENINGITIS.		ANTERIOR POLIOMYELITIS.		PULMONARY TUBERCULOSIS.		TYPHOID FEVER.	
		Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.
1911–1915, . .	17,880,869	1,669	9.3	1,920	10.7	3,089	17.3	1,095	6.1	636	3.5	263	1.5	20,913	116.9	1,381	7.7
1916–1920, . .	19,021,154	1,903	10.0	2,244	11.8	3,219	16.9	660	3.5	823	4.3	713	3.7	22,028	115.8	708	3.7

TABLE 13c. — *Mortality Rates for Certain Communicable Diseases in the Registration Area for 1917, 1918 and 1919.*[1]

YEAR.	Total Populations (estimated).	MEASLES.		WHOOPING COUGH.		DIPHTHERIA.		SCARLET FEVER.		CEREBROSPINAL MENINGITIS.		ANTERIOR POLIOMYELITIS.		PULMONARY TUBERCULOSIS.		TYPHOID FEVER.	
		Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.
1917, . . .	75,000,000	10,745	14.3	7,837	10.4	12,453	16.5	3,141	4.2	–	–	–	–	97,047	128.9	10,113	13.4
1918, . . .	81,868,104	8,806	10.8	13,728	16.8	11,280	13.8	–	–	–	–	–	–	108,365	132.4	10,210	12.5
1919, . . .	85,147,822	3,296	3.9	4,714	5.5	12,551	14.7	2,383	2.8	–	–	–	–	94,772	111.3	7,860	9.2

[1] See United States Public Health Service Reports, July 4, 1919, Feb. 13, 1920, and Nov. 19, 1920.

TABLE 14. — *Case, Death and Fatality Rates for Lobar Pneumonia and Influenza, 1918–1920, inclusive.*

YEAR.	Population based on State and Federal Censuses.	LOBAR PNEUMONIA.[1]					INFLUENZA.[2]				
		Cases.	Cases per 100,000.	Deaths.	Deaths per 100,000.	Fatality Rates.	Cases.	Cases per 100,000.	Deaths.	Deaths per 100,000.	Fatality Rates.
1	2	3	4	5	6	7	8	9	10	11	12
1918, .	3,804,231	13,374	351.5	10,339	271.7	77.5	145,262	3,818.4	13,783	362.3	9.5
1919, .	3,836,664	4,585	119.5	2,508	65.5	54.7	40,417	1,053.4	3,052	79.5	7.5
1920, .	3,869,098	5,558	143.6	2,781	71.9	50.0	36,312	938.5	1,700	43.9	4.7

[1] Made reportable in 1917.

[2] Made reportable in 1918.

TABLE 15. — *Case, Death and Fatality Rates for Gonorrhea and Syphilis, 1918–1920, inclusive.*

YEAR.	Population based on State and Federal Censuses.	GONORRHEA.[1]					SYPHILIS.[1]				
		Cases.	Cases per 100,000.	Deaths.	Deaths per 100,000.	Fatality Rates.	Cases.	Cases per 100,000.	Deaths.	Deaths per 100,000.	Fatality Rates.
1	2	3	4	5	6	7	8	9	10	11	12
1918, . .	3,804,231	7,681	201.9	6	.2	.08	3,284	86.3	280	7.4	8.5
1919, . .	3,836,664	9,435	245.9	8	.2	.08	4,127	107.5	281	7.3	6.8
1920, . .	3,869,098	7,225	186.7	4	.1	.05	2,987	77.2	225	5.8	7.5

[1] Made reportable in 1918.

TABLE 16. — *Cases and Deaths from Certain Diseases Dangerous to the Public Health, 1911–1920, inclusive.*

YEAR.	ACTINOMYCOSIS.		ANTHRAX.		CHICKEN POX.		RABIES AND DOG BITE.		DYSENTERY.		GERMAN MEASLES.		GLANDERS.		LEPROSY.		MALARIA.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
1911, . .	5	–	6	2	2,542	–	–	–	–	–	–	–	1	1	2	–	–	–
1912, . .	1	–	11	2	3,574	–	–	–	–	–	–	–	–	–	4	1	–	–
1913, . .	3	3	8	3	3,822	2	–	–	–	–	–	–	32	2	2	1	–	–
1914, . .	4	2	8	1	4,896	3	–	–	–	–	–	–	3	3	1	1	–	–
1915, . .	8	4	11	4	5,512	5	174	5	239	92	500	1	2	2	2	1	112	6
1916, . .	4	–	31	5	4,672	5	24	–	119	83	591	1	–	–	2	2	97	4
1917, . .	4	3	54	11	7,210	20	26	–	160	64	5,890	5	2	1	3	1	78	5
1918, . .	1	–	23	7	4,417	8	20	–	79	75	9,426	8	–	–	3	–	82	5
1919, . .	3	–	18	1	6,693	5	54	–	23	9	434	1	–	–	3	1	72	4
Median Figures.																		
1911–1919, .	4	–	11	3	4,672	5	26	–	119	75	591	1	1	1	2	1	82	5
1920, . .	3	1	17	4	5,355	11	67	–	37	26	484	–	–	–	3	3	60	5

TABLE 16. — *Cases and Deaths from Certain Diseases Dangerous to the Public Health, 1911–1920, inclusive* — Concluded.

YEAR.	MUMPS.		OPHTHALMIA NEONATORUM.		PELLAGRA.		SEPTIC SORE THROAT.		SMALLPOX.		TETANUS.		TRACHOMA.		TRICHINOSIS.		TYPHUS FEVER.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
1911, . .	–	–	1,372	–	–	–	–	–	11	2	38	27	21	–	–	–	–	–
1912, . .	–	–	1,750	–	–	–	–	–	220	1	24	27	46	–	10	3	–	–
1913, . .	–	–	2,304	5	–	–	–	–	157	–	23	33	112	–	5	4	2	1
1914, . .	–	–	2,620	–	–	–	–	–	38	–	31	28	68	–	5	3	5	1
1915, . .	2,128	1	2,894	–	33	26	865	–	24	9	32	33	50	–	–	–	–	–
1916, . .	2,318	3	1,932	–	47	37	159	67	32	–	34	31	88	–	24	3	–	–
1917, . .	7,125	5	2,325	3	28	20	270	59	65	10	28	15	87	–	3	2	–	–
1918, . .	4,972	9	1,877	1	19	21	107	25	27	–	27	33	103	–	15	–	2	1
1919, . .	3,497	10	1,687	–	13	15	216	40	40	2	21	22	72	–	3	–	–	–
Median Figures.																		
1911-1919, .	3,497	5	1,932	–	28	21	216	40	38	1	28	28	72	–	5	2	–	–
920, . .	5,962	6	1,638	–	16	14	153	29	29	1	25	21	87	–	5	–	–	–

Cases and Deaths from Diseases Dangerous to the Public Health, 1920.

Index to Line Numbers in the Table of Cases and Deaths from Diseases Dangerous to the Public Health, 1920.

Westminster, . . 222	Wilbraham, . . . 177	Winthrop, . . . 53
Weston, . . . 181	Williamsburg, . . 200	Woburn, . . . 48
Westport, . . . 147	Williamstown, . . 134	Worcester, . . . 5
Westwood, . . . 234	Wilmington, . . . 172	Worthington, . . 313
Weymouth, . . . 54	Winchendon, . . 110	Wrentham, . . . 160
Whately, . . . 256	Winchester, . . . 71	
Whitman, . . . 88	Windsor, . . . 342	Yarmouth, . . . 254

Cases and Deaths from Diseases Dangerous

Line No.	Cities and Towns grouped in Order of Population.	Population estimated as of July 1, 1920.	63A Anterior Poliomyelitis.		19A Chicken Pox.		9 Diphtheria.		61A Ep. Cerebrospinal Meningitis.		19B German Measles.		10 Influenza.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
1	Massachusetts,	4,062,942	696	140	5355	11	7513	595	182	129	484	–	36312	1700
2	Cities over 500,000.													
3	Boston,	823,413	191	48	1052	–	1773	140	36	33	107	–	8417	473
4	Cities over 150,000.													
5	Worcester,	180,103	5	–	154	1	240	14	4	3	16	–	1602	83
6	Cities, 100,000–150,000.	*696,382*	*77*	*21*	*1050*	*2*	*1444*	*144*	*54*	*39*	*65*	–	*5949*	*254*
7	Fall River,	130,515	4	–	82	1	284	40	8	10	7	–	623	33
8	New Bedford,	123,022	–	–	77	–	210	32	13	7	2	–	758	38
9	Springfield,	117,601	4	2	186	–	141	17	6	6	25	–	560	60
10	Cambridge,	112,973	29	7	568	1	228	6	6	4	22	–	1776	39
11	Lowell,	109,733	14	6	72	–	266	21	11	7	–	–	1236	36
12	Lynn,	102,538	26	6	65	–	315	28	10	5	9	–	996	48
13	Cities, 50,000–100,000.	*487,077*	*88*	*18*	*367*	*4*	*960*	*91*	*17*	*8*	*63*	–	*4609*	*177*
14	Somerville,	96,874	19	5	61	–	121	22	2	1	10	–	1068	30
15	Lawrence,	94,806	12	2	65	1	145	22	6	2	2	–	354	28
16	Brockton,	67,902	12	1	73	1	109	7	3	2	3	–	149	19
17	Holyoke,	64,030	–	–	15	1	45	6	–	–	4	–	136	7
18	Haverhill,	55,007	25	9	67	–	247	10	3	1	37	–	1390	43
19	Chelsea,	54,858	11	–	54	1	117	4	–	2	6	–	459	23
20	Malden,	53,600	9	1	32	–	176	20	3	–	1	–	1053	27
21	Cities and Towns, 25,000–50,000.	*513,452*	*123*	*14*	*831*	–	*1190*	*75*	*25*	*14*	*49*	–	*3789*	*205*
22	Quincy,	49,039	12	–	70	–	169	4	6	1	2	–	251	21
23	Pittsfield,	47,404	5	–	80	–	28	–	3	2	5	–	465	28
24	Newton,	46,556	15	2	185	–	96	6	1	–	8	–	396	14
25	Salem,	43,502	7	–	68	–	188	12	5	5	2	–	67	14
26	Everett,	42,129	8	1	94	–	167	10	–	–	3	–	405	8
27	Fitchburg,	41,562	5	2	36	–	52	5	–	–	3	–	321	12
28	Brookline,	39,427	9	–	126	–	36	1	1	–	7	–	227	14
29	Medford,	38,174	13	1	25	–	60	1	–	–	2	–	223	15
30	Taunton,	38,141	5	3	5	–	51	4	2	2	2	–	227	22
31	Chicopee,	35,071	–	–	4	–	137	15	3	1	10	–	27	21
32	Waltham,	32,571	28	3	117	–	89	11	1	2	4	–	914	17
33	Revere,	32,427	9	1	–	–	102	5	2	–	–	–	94	8
34	Beverly,	27,449	7	1	21	–	15	1	1	1	1	–	172	11
35	Cities and Towns, 10,000–25,000.	*610,123*	*103*	*16*	*861*	–	*936*	*62*	*28*	*13*	*80*	–	*4947*	*236*
36	Gloucester,	24,561	4	1	10	–	76	8	–	1	–	–	75	8
37	Northampton,	23,971	2	–	14	–	62	6	–	–	7	–	129	5
38	North Adams,	22,051	–	–	9	–	23	2	2	1	–	–	282	15
39	Peabody,	21,651	3	–	17	–	42	3	2	1	4	–	191	9
40	Westfield,	20,875	–	–	43	–	30	3	1	–	–	–	158	4
41	Attleboro,	20,839	–	–	8	–	41	2	2	2	3	–	215	11
42	Watertown,	20,307	1	–	114	–	33	1	2	1	2	–	119	5
43	Framingham,	18,892	8	–	36	–	6	1	2	–	–	–	181	10

to the Public Health, 1920.

92 Lobar Pneumonia.		6 Measles.		19C Mumps.		38A Ophthalmia Neonatorum.		7 Scarlet Fever.		28-29 Tuberculosis, Pulmonary.		30-35 Tuberculosis, Other Forms.		1 Typhoid Fever.		8 Whooping Cough.		38C Gonorrhea.		37 Syphilis.		Line No.
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
5558	2781	32141	347	5962	6	1638	–	10260	215	6696	3743	800	639	935	96	9994	542	7225	4	2987	225	1
																						2
1518	661	6450	66	1280	1	476	–	1874	70	2005	816	237	135	119	11	2551	155	3042	–	1183	67	3
																						4
344	173	137	3	425	–	202	–	976	22	328	169	33	39	21	3	127	11	366	–	246	20	5
1084	*411*	*4456*	*112*	*945*	*4*	*524*	–	*1984*	*40*	*1307*	*626*	*197*	*131*	*248*	*27*	*1790*	*103*	*1467*	*3*	*624*	*31*	6
210	54	507	18	13	1	140	–	138	4	215	108	31	18	118	6	94	14	209	–	67	6	7
79	28	420	23	78	–	174	–	308	2	334	127	48	30	50	9	70	13	182	–	56	8	8
231	72	1138	11	156	–	74	–	458	22	185	81	21	22	16	6	413	18	403	3	245	9	9
247	78	914	14	595	3	44	–	287	4	208	133	27	12	18	3	884	24	195	–	57	2	10
175	96	1360	44	24	–	79	–	227	2	199	85	44	35	27	3	193	22	302	–	130	1	11
142	83	117	2	79	–	13	–	566	6	166	92	26	14	19	–	136	12	176	–	69	5	12
654	*326*	*4389*	*55*	*407*	–	*197*	–	*995*	*20*	*762*	*389*	*88*	*80*	*141*	*14*	*1238*	*76*	*651*	–	*244*	*15*	13
153	69	688	4	89	–	28	–	207	3	142	64	19	11	16	3	213	18	89	–	25	–	14
108	61	651	19	30	–	14	–	244	12	179	104	22	22	55	8	347	24	139	–	95	4	15
82	57	697	8	59	–	53	–	118	–	94	38	18	14	13	1	340	4	69	–	44	3	16
17	46	454	12	–	–	12	–	108	1	73	66	2	20	8	1	38	9	78	–	15	3	17
156	43	1007	8	149	–	21	–	84	1	109	54	12	4	14	–	99	3	185	–	43	3	18
86	21	432	2	47	–	58	–	104	–	97	33	6	3	28	1	56	5	66	–	12	1	19
52	29	460	2	33	–	11	–	130	3	68	30	9	6	7	–	145	13	25	–	10	1	20
623	*362*	*5404*	*21*	*1052*	–	*73*	–	*1070*	*17*	*669*	*368*	*74*	*67*	*111*	*7*	*1192*	*74*	*613*	*1*	*213*	*32*	21
52	30	154	–	47	–	3	–	165	2	66	26	11	8	9	–	122	12	43	1	17	2	22
58	34	449	1	10	–	11	–	56	1	89	38	7	7	22	–	19	1	62	–	13	3	23
88	44	2001	1	276	–	3	–	143	3	43	20	5	6	6	–	357	5	30	–	5	–	24
77	28	360	–	67	–	8	–	103	2	50	40	6	6	3	–	97	4	56	–	27	1	25
62	33	414	4	136	–	11	–	80	–	64	25	8	4	10	1	131	19	41	–	8	–	26
69	20	549	2	31	–	4	–	18	–	62	49	6	5	6	–	13	1	67	–	27	–	27
47	18	623	2	241	–	2	–	81	1	40	18	4	4	5	–	131	2	24	–	12	1	28
33	29	302	1	62	–	4	–	112	3	45	20	4	2	2	–	24	3	21	–	3	1	29
35	49	106	–	23	–	5	–	92	2	86	60	4	7	16	4	43	5	125	–	56	23	30
8	16	77	7	1	–	6	–	58	1	36	34	10	7	5	–	35	19	16	–	6	–	31
57	28	355	2	48	–	13	–	63	1	40	18	8	6	10	–	195	2	30	–	12	1	32
6	15	–	1	–	–	2	–	51	1	23	11	1	5	7	2	–	1	79	–	12	–	33
31	18	14	–	110	–	1	–	48	–	25	9	–	–	10	–	25	–	19	–	15	–	34
796	*380*	*5439*	*44*	*756*	–	*95*	–	*1566*	*29*	*879*	*492*	*85*	*89*	*146*	*21*	*1497*	*61*	*492*	–	*304*	*18*	35
8	17	108	2	15	–	1	–	95	2	33	21	4	6	9	3	30	2	9	–	10	–	36
28	11	129	1	33	–	4	–	35	–	36	45	1	2	19	5	54	3	16	–	11	12	37
24	11	178	2	12	–	1	–	7	–	30	14	3	6	8	–	18	–	46	–	7	–	38
31	16	79	–	6	–	3	–	64	2	31	13	6	4	4	1	6	1	22	–	20	1	39
35	17	39	–	20	–	–	–	16	–	30	45	1	2	3	–	121	4	13	–	9	–	40
13	5	167	1	3	–	2	–	71	1	33	31	7	3	10	–	2	–	20	–	15	–	41
32	11	306	2	33	–	6	–	57	–	27	7	3	3	1	–	85	1	26	–	3	–	42
19	13	215	2	3	–	1	–	63	1	29	9	5	2	2	–	171	2	9	–	4	–	43

Cases and Deaths from Diseases Dangerous

Line No.	Cities and Towns grouped in Order of Population.	Population estimated as of July 1, 1920.	63A Anterior Poliomyelitis.		19A Chicken Pox.		9 Diphtheria.		61A Ep. Cerebrospinal Meningitis.		19B German Measles.		10 Influenza.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
44	Arlington,	18,744	2	–	38	–	33	1	1	1	1	–	272	13
45	Gardner,	18,121	1	–	15	–	7	–	–	1	–	–	68	11
46	Melrose,	18,093	4	–	20	–	39	1	–	–	14	–	98	11
47	Leominster,	17,714	2	1	36	–	20	3	2	–	–	–	251	8
48	Woburn,	17,556	2	1	43	–	18	–	–	–	4	–	181	10
49	Methuen,	16,673	2	1	17	–	59	3	1	–	1	–	152	2
50	Marlborough,	15,948	2	1	8	–	14	–	–	–	1	–	25	6
51	Southbridge,	15,905	1	1	6	–	5	1	–	–	2	–	60	4
52	Newburyport,	15,686	9	–	9	–	21	4	–	–	1	–	183	9
53	Winthrop,	15,493	3	1	38	–	18	3	–	–	6	–	210	8
54	Weymouth,	15,089	20	–	7	–	27	2	3	1	–	–	114	3
55	Greenfield,	14,904	–	–	91	–	54	3	1	1	2	–	231	9
56	Milford,	14,340	–	–	12	–	9	–	–	–	3	–	23	3
57	Wakefield,	14,214	4	1	10	–	33	–	–	–	–	–	27	2
58	Norwood,	14,065	2	1	14	–	5	–	–	–	–	–	80	2
59	Plymouth,	13,744	1	1	8	–	21	1	3	1	–	–	78	3
60	Webster,	13,664	–	–	22	–	19	–	1	–	–	–	88	7
61	West Springfield,	13,542	1	–	2	–	7	–	–	1	2	–	56	6
62	Adams,	13,416	–	–	–	–	13	1	1	–	–	–	119	5
63	Clinton,	13,312	1	–	10	–	16	2	–	–	1	–	112	5
64	Danvers,	13,017	4	1	15	–	16	2	–	–	3	–	80	4
65	Dedham,	12,876	5	1	4	–	23	–	1	–	–	–	52	4
66	Saugus,	12,497	1	–	18	–	11	1	–	–	1	–	265	6
67	Natick,	12,426	4	–	4	–	4	–	–	–	–	–	82	5
68	Easthampton,	11,220	–	–	2	–	54	4	–	–	–	–	50	2
69	Bridgewater,	11,146	–	–	7	–	5	–	–	–	1	–	23	3
70	Athol,	11,080	3	2	13	–	2	1	–	–	1	–	–	3
71	Winchester,	10,729	3	1	25	–	19	–	1	–	13	–	91	2
72	Belmont,	10,727	3	1	70	–	23	1	1	–	5	–	397	4
73	Braintree,	10,672	4	–	41	–	12	1	1	–	2	–	101	2
74	Palmer,	10,363	1	–	5	–	16	1	–	1	–	–	28	7
75	Towns, 5,000-10,000.	*342,018*	*64*	*14*	*508*	*1*	*564*	*46*	*11*	*11*	*64*	–	*2969*	*105*
76	Ware,	9,922	–	–	1	–	6	–	1	1	–	–	22	1
77	Northbridge,	9,718	–	–	5	–	2	1	–	–	–	–	96	5
78	North Attleborough,	9,569	–	–	–	–	13	1	–	–	–	–	1	5
79	Milton,	9,303	5	1	27	–	4	–	–	–	1	–	155	4
80	Middleborough,	9,064	–	–	25	–	8	–	–	–	–	–	31	8
81	Montague,	9,029	1	1	15	–	25	1	1	1	1	–	65	2
82	Andover,	8,682	6	2	40	–	18	–	–	–	5	–	122	8
83	Swampscott,	8,533	1	–	1	–	4	–	–	–	1	–	42	2
84	Needham,	8,120	5	–	11	–	11	–	–	–	1	–	230	1
85	Stoneham,	7,905	2	1	6	–	7	1	–	–	–	–	178	4
86	Marblehead,	7,887	3	1	6	–	15	2	1	–	–	–	14	1
87	Reading,	7,832	6	2	–	–	27	1	–	–	–	–	63	2
88	Whitman,	7,759	1	–	9	–	2	–	–	–	–	–	55	3
89	Stoughton,	7,675	–	–	–	–	32	2	–	–	3	–	–	–
90	Ludlow,	7,610	–	–	6	–	3	–	1	1	1	–	11	6
91	Wellesley,	7,507	2	1	44	–	43	1	–	–	5	–	133	2
92	Fairhaven,	7,480	–	–	19	–	11	3	1	2	–	–	10	–
93	Great Barrington,	7,356	–	–	1	–	–	–	–	1	–	–	39	3
94	Franklin,	7,273	2	–	9	–	72	3	–	–	–	–	5	1
95	Rockland,	7,225	4	–	3	–	7	–	–	–	–	–	10	–
96	Maynard,	7,166	–	–	–	–	14	3	1	1	–	–	9	3
97	Amesbury,	7,137	2	–	31	–	26	1	–	–	–	–	302	4
98	Concord,	6,952	7	1	10	–	18	–	2	1	8	–	281	–
99	Tewksbury,	6,843	–	–	4	–	6	1	–	–	–	–	3	–
100	Grafton,	6,797	2	–	–	–	4	–	–	1	–	–	–	1
101	Ipswich,	6,788	–	–	3	–	4	–	–	–	1	–	8	4
102	Hudson,	6,774	1	1	1	–	7	–	2	1	–	–	15	2
103	Canton,	6,483	1	–	18	–	3	–	–	–	7	–	8	–

to the Public Health, 1920 — Continued.

92 Lobar Pneumonia.		6 Measles.		19C Mumps.		38A Ophthalmia Neonatorum.		7 Scarlet Fever.		28-29 Tuberculosis, Pulmonary.		30-35 Tuberculosis, Other Forms.		1 Typhoid Fever.		8 Whooping Cough.		38C Gonorrhea.		37 Syphilis.		
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Line No.
16	10	229	1	53	–	1	–	109	–	36	9	2	8	5	2	56	1	8	–	5	1	44
23	16	121	2	2	–	3	–	34	–	58	23	8	8	4	–	1	–	11	–	4	1	45
17	9	364	2	20	–	24	–	41	–	16	7	5	5	3	–	40	1	12	–	2	–	46
33	9	32	–	2	–	–	–	42	1	55	4	5	2	3	1	12	2	44	–	7	–	47
44	11	96	–	12	–	–	–	32	1	22	14	3	5	4	–	30	3	19	–	4	1	48
20	8	172	3	26	–	4	–	62	1	20	8	1	1	2	1	175	4	4	–	2	–	49
26	15	49	–	80	–	1	–	43	1	32	10	5	6	7	2	8	–	6	–	6	–	50
41	10	12	–	–	–	2	–	6	–	10	2	2	1	2	–	4	1	16	–	9	–	51
16	11	161	–	73	–	1	–	13	–	13	12	1	1	1	1	36	4	9	–	1	–	52
36	4	283	1	144	–	–	–	78	–	13	5	–	–	1	–	100	2	10	–	4	–	53
19	12	69	1	1	–	1	–	37	–	14	9	1	2	1	–	17	3	10	–	3	–	54
11	5	304	1	10	–	6	–	96	11	12	1	–	2	1	–	60	3	20	–	13	–	55
13	14	21	1	–	–	–	–	25	–	29	18	1	2	1	–	8	–	5	–	1	–	56
11	6	134	3	–	–	2	–	26	1	24	9	1	2	2	–	6	1	8	–	1	–	57
39	11	46	–	6	–	–	–	27	–	12	–	2	1	6	–	57	5	18	–	8	–	58
5	7	211	7	1	–	–	–	24	–	18	6	3	2	7	–	17	1	8	–	2	–	59
18	6	39	–	9	–	8	–	10	1	22	14	5	2	2	–	30	2	12	–	2	–	60
23	9	57	2	18	–	–	–	29	–	5	8	–	1	7	–	39	1	14	–	2	–	61
11	3	102	–	–	–	1	–	5	–	25	10	1	–	9	2	5	–	7	–	2	–	62
30	11	360	3	–	–	5	–	32	–	48	21	5	4	2	–	6	1	9	–	1	–	63
14	14	2	–	14	–	2	–	63	1	30	18	–	1	4	1	–	–	6	–	62	1	64
10	10	136	1	4	–	3	–	30	1	7	7	–	1	–	–	27	2	8	–	3	–	65
7	6	17	–	4	–	4	–	59	–	6	5	1	1	3	1	28	1	3	–	2	–	66
22	14	23	–	7	–	1	–	45	–	9	6	–	1	1	1	29	–	8	–	–	–	67
32	8	265	3	–	–	2	–	55	3	19	10	2	–	1	–	11	–	6	–	1	–	68
15	11	254	2	1	–	–	–	57	–	15	17	1	1	2	–	–	–	9	–	58	–	69
6	4	2	–	27	–	3	–	12	–	6	2	–	–	1	–	17	5	14	–	2	–	70
13	5	109	–	63	–	3	–	21	–	9	5	–	1	2	–	81	1	5	–	1	–	71
18	6	352	–	49	–	–	–	20	–	15	5	–	–	2	–	13	–	7	–	2	1	72
8	4	89	1	5	–	–	–	23	1	16	38	–	–	2	–	75	1	10	–	2	–	73
9	10	107	–	–	–	–	–	2	–	14	4	–	–	2	–	22	3	5	–	13	–	74
267	*231*	*3028*	*22*	*463*	*1*	*43*	–	*984*	*9*	*344*	*214*	*51*	*55*	*101*	*7*	*735*	*25*	*273*	–	*80*	*11*	75
1	6	9	–	1	–	2	–	14	1	2	2	2	5	–	–	1	1	7	–	2	–	76
8	6	59	1	18	–	1	–	8	–	6	4	–	1	3	–	4	3	14	–	1	–	77
1	4	1	1	2	–	–	–	2	–	17	9	–	1	–	–	–	–	10	–	1	–	78
5	6	269	–	10	–	1	–	31	–	8	2	–	–	–	–	64	1	1	–	–	–	79
19	7	265	2	76	–	6	–	10	–	14	3	1	1	–	–	16	–	10	–	1	–	80
3	4	9	–	2	–	6	–	5	–	3	4	–	1	2	1	6	1	7	–	3	–	81
–	–	25	–	17	–	–	–	15	–	12	1	3	1	2	–	18	1	5	–	–	–	82
14	2	40	–	7	–	3	–	40	–	3	–	–	–	3	–	6	1	6	–	1	–	83
7	11	37	–	15	–	1	–	19	–	6	3	–	1	3	–	12	–	5	–	4	1	84
3	8	7	1	1	–	–	–	8	–	4	3	–	1	3	–	3	–	4	–	1	–	85
1	1	4	–	1	–	–	–	24	1	4	2	–	2	1	1	4	–	9	–	–	–	86
4	3	54	–	2	–	–	–	13	–	7	5	–	4	–	–	–	1	6	–	–	–	87
7	4	137	–	–	–	–	–	8	–	5	5	2	–	–	–	29	1	4	–	1	–	88
–	9	130	1	–	–	–	–	8	–	6	1	2	1	1	–	11	–	1	–	–	1	89
4	4	61	4	3	–	3	–	17	–	10	7	–	–	1	–	–	–	–	–	–	–	90
13	2	84	–	19	–	–	–	46	–	5	3	–	–	1	–	102	–	3	–	–	–	91
2	6	33	3	19	–	5	–	173	–	12	6	1	1	4	–	6	–	–	–	–	–	92
24	11	15	–	5	–	–	–	22	–	3	3	–	1	1	–	24	1	12	–	–	1	93
17	7	75	1	22	–	–	–	27	–	5	6	–	–	–	–	–	–	9	–	1	–	94
11	8	188	–	1	–	2	–	11	–	15	8	–	1	–	–	3	–	7	–	1	–	95
–	1	40	1	–	–	–	–	11	1	11	8	3	1	–	–	6	–	3	–	–	–	96
14	4	167	1	28	–	2	–	26	1	12	5	1	2	2	–	15	–	18	–	1	1	97
10	5	42	1	12	–	1	–	49	–	8	4	1	–	1	–	5	–	44	–	12	1	98
1	2	3	–	–	–	–	–	13	–	2	1	–	–	–	–	–	–	–	–	–	–	99
–	8	6	–	–	–	–	–	3	–	9	22	–	3	1	–	–	–	1	–	–	2	100
–	1	3	–	1	–	–	–	18	1	9	2	–	1	33	2	38	1	4	–	1	–	101
–	6	10	–	–	–	–	–	4	–	14	10	1	1	–	–	–	2	17	–	1	–	102
3	2	269	1	16	–	–	–	13	–	11	3	22	8	1	–	3	–	2	–	4	–	103

Cases and Deaths from Diseases Dangerous

Line No.	Cities and Towns grouped in Order of Population.	Population estimated as of July 1, 1920.	63A Anterior Poliomyelitis.		19A Chicken Pox.		9 Diphtheria.		61A Ep. Cerebrospinal Meningitis.		19B German Measles.		10 Influenza.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
104	Westborough,	6,425	1	–	10	–	8	–	–	–	–	–	144	3
105	North Andover,	6,399	1	1	5	–	11	1	–	–	3	–	29	1
106	Mansfield,	6,386	1	–	115	–	15	1	–	–	3	–	26	–
107	Dartmouth,	6,320	–	–	2	–	7	3	–	–	–	–	49	3
108	Wareham,	6,296	–	–	–	–	–	–	–	–	–	–	13	2
109	Lexington,	6,184	2	1	11	–	4	–	–	–	2	–	196	–
110	Winchendon,	6,148	1	–	5	–	2	–	–	–	–	–	87	3
111	Walpole,	6,115	1	–	4	–	2	–	–	–	–	–	44	1
112	Amherst,	6,022	1	–	10	–	6	–	–	–	17	–	80	3
113	Millbury,	5,873	–	–	5	1	5	9	–	–	–	–	36	–
114	Abington,	5,844	1	–	5	–	9	2	–	–	–	–	2	1
115	Agawam,	5,654	–	–	–	–	4	–	–	–	–	–	–	2
116	Hingham,	5,576	1	–	1	–	3	–	–	–	2	–	46	1
117	Orange,	5,478	–	–	1	–	6	1	–	–	–	–	3	1
118	South Hadley,	5,476	–	–	–	–	5	–	–	–	2	–	91	3
119	Chelmsford,	5,360	–	–	–	–	7	–	–	–	–	–	50	–
120	Barnstable,	5,328	2	–	22	–	2	–	–	–	1	–	44	3
121	Monson,	5,259	–	1	12	–	7	–	–	–	–	–	30	1
122	Randolph,	5,187	–	–	–	–	–	1	–	–	–	–	–	–
123	Uxbridge,	5,181	1	–	2	–	53	3	–	–	–	–	24	2
124	Spencer	5,118	–	–	3	–	16	4	1	1	–	–	67	3
125	Towns, 2,500–5,000.	*188,565*	*22*	*4*	*261*	*2*	*235*	*9*	*4*	*5*	*38*	–	*1732*	*75*
126	Easton,	4,986	–	–	16	–	9	1	–	–	–	–	80	4
127	Lee,	4,858	–	–	3	–	13	–	–	–	–	–	9	4
128	Falmouth,	4,724	–	–	2	–	–	–	2	2	–	–	77	1
129	Dracut,	4,606	–	–	4	–	4	–	–	–	–	–	33	1
130	Rockport,	4,502	–	–	2	–	8	–	–	–	–	–	84	2
131	Dudley,	4,483	1	1	9	–	2	–	–	–	–	–	11	3
132	Templeton,	4,420	–	–	1	–	6	–	–	–	–	–	69	4
133	Warren,	4,351	–	–	–	–	1	–	–	–	17	–	101	2
134	Williamstown,	4,267	–	–	–	–	36	–	–	–	–	–	3	2
135	Provincetown,	4,218	–	–	18	–	3	1	–	–	–	–	22	–
136	Auburn,	4,177	–	–	3	–	9	–	–	–	–	–	30	2
137	Dalton,	4,160	–	–	1	–	1	–	–	–	–	–	14	3
138	East Bridgewater,	4,028	–	–	–	–	–	–	–	–	–	–	5	2
139	Barre,	4,017	–	–	–	–	1	–	–	–	2	–	41	3
140	Somerset,	3,981	–	–	–	–	13	–	–	–	–	–	35	1
141	Medfield,	3,836	2	–	–	–	–	–	–	–	–	–	4	–
142	Billerica,	3,720	–	–	1	–	11	1	–	–	–	–	–	–
143	Blackstone,	3,705	–	–	1	–	5	–	–	–	–	–	3	1
144	Shrewsbury,	3,679	–	–	–	1	–	–	–	–	–	–	24	1
145	Hardwick,	3,669	–	–	3	–	20	3	–	–	2	–	31	–
146	Foxborough,	3,641	–	–	8	–	13	–	–	–	–	–	80	4
147	Westport,	3,610	–	–	2	–	2	–	–	–	–	–	4	1
148	Oxford,	3,600	–	–	19	–	4	–	–	1	–	–	40	–
149	Lenox,	3,430	–	–	2	–	1	–	–	1	–	–	28	1
150	Leicester,	3,411	–	–	2	–	1	–	–	–	–	–	–	1
151	Nantucket,	3,380	–	1	–	–	–	–	–	1	–	–	49	1
152	Hadley,	3,359	–	–	2	–	2	–	–	–	–	–	4	–
153	Hatfield,	3,302	–	–	1	–	1	–	–	–	13	–	–	–
154	Deerfield,	3,291	–	–	5	–	1	–	–	–	1	–	7	–
155	West Bridgewater,	3,272	–	–	–	–	2	–	–	–	–	–	–	1
156	Manchester,	3,227	4	–	1	–	2	–	–	–	–	–	47	1
157	Swansea,	3,162	–	–	–	–	3	–	–	–	–	–	11	–
158	Seekonk,	3,153	–	–	–	–	–	–	–	–	–	–	–	1
159	Hopedale,	3,140	–	–	3	–	1	–	–	–	–	–	–	–
160	Wrentham,	3,112	–	–	2	–	3	–	–	–	–	–	6	–
161	Acushnet,	3,111	–	–	1	–	1	–	–	–	–	–	6	3
162	Holbrook,	3,084	1	1	–	–	9	–	–	–	–	–	5	1
163	Cohasset,	3,024	–	–	9	–	–	–	–	–	–	–	14	–

to the Public Health, 1920 — Continued.

92 Lobar Pneumonia.		6 Measles.		19C Mumps.		38A Ophthalmia Neonatorum.		7 Scarlet Fever.		28-29 Tuberculosis, Pulmonary.		30-35 Tuberculosis, Other Forms.		1 Typhoid Fever.		8 Whooping Cough.		38C Gonorrhea.		37 Syphilis.		
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Line No.
20	22	45	–	19	–	–	–	19	–	17	9	–	1	10	–	–	–	13	–	20	4	104
6	6	73	–	6	–	–	–	23	2	7	5	3	2	–	–	38	–	1	–	–	–	105
6	1	126	–	2	–	1	–	14	–	7	7	–	–	1	–	78	1	10	–	5	–	106
3	4	28	1	4	–	1	–	19	–	8	2	–	2	6	2	1	–	–	–	–	–	107
5	5	62	–	–	–	1	–	6	1	4	4	1	1	2	–	8	2	3	–	2	–	108
5	3	119	1	21	–	–	–	15	–	5	8	–	–	–	–	37	1	4	–	–	–	109
7	4	107	–	26	–	–	–	71	–	5	4	–	1	–	–	27	–	–	–	1	–	110
3	1	10	–	5	–	3	–	13	–	5	5	2	1	–	–	22	–	6	–	1	–	111
11	2	45	–	6	–	1	–	10	–	3	–	–	–	4	–	64	2	1	–	–	–	112
6	4	3	–	22	–	1	–	19	–	4	1	–	–	1	–	–	–	3	–	1	–	113
2	4	51	–	13	1	–	–	35	–	4	2	–	1	1	–	13	1	1	–	–	–	114
–	4	–	–	–	–	–	–	7	–	4	3	–	1	3	–	–	1	–	–	–	–	115
6	4	37	–	2	–	–	–	25	–	4	2	–	–	3	1	24	–	2	–	1	–	116
–	4	–	–	–	–	–	–	1	–	12	6	1	2	5	–	–	–	1	–	–	–	117
1	2	29	1	–	–	–	–	14	–	3	3	–	–	–	–	17	2	1	–	2	–	118
–	3	49	–	3	–	1	–	18	–	2	2	–	1	1	–	–	–	–	–	–	–	119
8	6	77	–	5	–	–	–	11	–	3	3	1	–	1	–	28	–	9	–	–	–	120
3	3	15	–	36	–	–	–	5	–	6	9	–	1	–	–	2	1	–	–	10	–	121
–	1	3	–	–	–	–	–	7	–	2	2	–	–	–	–	–	–	1	–	1	–	122
2	5	105	1	–	–	1	–	9	1	10	4	3	2	–	–	–	–	6	–	–	–	123
1	5	2	–	15	–	–	–	5	–	6	1	1	1	–	–	–	–	2	–	–	–	124
143	*110*	*1266*	*17*	*279*	–	*17*	–	*409*	*6*	*209*	*156*	*15*	*19*	*28*	*5*	*396*	*18*	*103*	–	*33*	*12*	125
1	3	85	–	2	–	1	–	13	1	6	4	1	2	–	–	4	–	2	–	1	–	126
–	–	89	–	–	–	–	–	31	–	6	3	–	2	–	–	1	–	1	–	–	–	127
–	2	110	3	3	–	–	–	–	–	13	–	–	–	–	–	–	–	6	–	1	–	128
–	3	6	–	1	–	–	–	4	1	3	1	1	–	–	–	–	–	1	–	–	–	129
–	1	31	–	–	–	–	–	16	–	5	2	–	–	3	–	9	1	1	–	1	–	130
9	–	16	–	–	–	–	–	1	–	10	2	2	2	–	–	2	1	–	–	–	–	131
1	1	1	–	–	–	1	–	11	–	1	2	–	–	–	–	–	–	2	–	–	–	132
7	2	9	1	6	–	1	–	1	–	4	1	–	2	–	–	–	–	4	–	–	–	133
–	–	2	–	–	–	–	–	–	–	2	3	–	1	1	1	1	1	–	–	–	–	134
1	2	3	–	–	–	–	–	1	–	4	1	1	–	1	1	10	–	7	–	1	–	135
1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	136
1	4	32	–	–	–	–	–	6	–	–	5	–	–	–	–	–	–	–	–	–	–	137
1	4	22	–	–	–	–	–	3	–	3	5	–	–	1	–	–	–	2	–	2	–	138
–	2	150	2	2	–	–	–	6	–	1	3	–	1	–	–	2	–	–	–	–	–	139
10	3	–	1	–	–	1	–	5	–	7	4	1	–	–	–	1	–	–	–	–	–	140
2	8	39	–	12	–	2	–	1	–	25	28	–	2	–	–	19	–	–	–	–	4	141
1	5	71	–	1	–	–	–	8	–	3	6	–	–	1	–	9	2	1	–	–	–	142
–	7	–	2	–	–	–	–	–	–	4	2	–	–	–	–	–	–	–	–	–	–	143
2	1	7	–	1	–	–	–	4	–	2	1	–	–	–	–	–	–	1	–	–	–	144
–	–	65	1	10	–	–	–	10	2	1	2	–	–	–	–	1	–	–	–	–	–	145
11	7	9	–	2	–	1	–	23	–	12	9	4	1	7	–	63	–	10	–	11	3	146
1	–	20	–	–	–	–	–	3	–	1	2	–	–	–	–	–	–	–	–	1	–	147
1	2	1	–	17	–	–	–	13	–	1	1	–	1	1	–	1	2	–	–	–	–	148
4	2	1	–	10	–	–	–	6	–	2	2	1	1	1	–	1	–	3	–	–	–	149
3	3	–	–	–	–	–	–	12	1	1	1	–	–	1	–	–	–	–	–	–	–	150
–	5	2	–	–	–	–	–	6	–	–	2	–	–	–	–	3	–	–	–	–	–	151
–	–	3	–	2	–	–	–	4	–	1	–	–	–	–	–	6	–	–	–	–	–	152
5	3	18	–	13	–	–	–	9	–	3	–	–	–	–	–	28	1	–	–	–	–	153
1	2	54	–	8	–	–	–	14	1	–	2	–	–	–	–	12	3	–	–	–	–	154
–	1	–	1	–	–	–	–	–	–	1	2	–	–	–	–	–	–	–	–	–	–	155
–	–	12	–	1	–	–	–	12	–	6	1	–	–	–	–	20	1	4	–	1	1	156
4	2	1	–	–	–	–	–	3	–	2	3	–	–	–	–	–	–	1	–	–	–	157
–	1	–	–	–	–	–	–	–	–	2	3	–	–	–	–	1	–	–	–	–	–	158
–	–	14	1	3	–	–	–	9	–	1	–	–	–	–	–	–	–	2	–	1	–	159
14	6	50	1	1	–	–	–	24	–	4	4	–	1	–	–	34	3	1	–	1	–	160
–	–	17	2	4	–	1	–	6	–	5	2	–	–	–	–	–	–	–	–	–	–	161
–	1	7	–	2	–	–	–	1	–	5	3	–	–	–	–	–	–	5	–	–	–	162
1	–	1	–	9	–	–	–	3	–	1	–	1	–	–	–	6	–	7	–	1	–	163

Cases and Deaths from Diseases Dangerous

Line No.	Cities and Towns grouped in Order of Population.	Population estimated as of July 1, 1920.	63A Anterior Poliomyelitis.		19A Chicken Pox.		9 Diphtheria.		61A Ep. Cerebrospinal Meningitis.		19B German Measles.		10 Influenza.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
164	Hanover,	3,020	1	–	–	–	–	–	–	–	–	–	24	1
165	Medway,	3,002	–	–	–	–	4	–	1	–	–	–	1	–
166	Pepperell,	2,958	–	–	–	–	–	–	–	–	–	–	–	2
167	Holden,	2,895	–	–	3	–	–	–	–	–	1	–	141	1
168	Bourne,	2,880	1	1	3	–	–	–	–	–	–	–	21	2
169	Holliston,	2,867	3	–	5	–	3	–	–	–	–	–	30	–
170	Scituate,	2,849	1	–	1	–	1	–	–	–	–	–	–	–
171	Westford,	2,833	–	–	42	–	10	–	–	–	–	–	64	3
172	Wilmington,	2,820	2	–	2	–	1	–	–	–	–	–	3	–
173	North Brookfield,	2,812	–	–	–	–	1	–	–	–	–	–	20	1
174	Dighton,	2,775	–	–	–	–	–	–	–	–	–	–	5	3
175	Ayer,	2,759	1	–	41	1	6	–	–	–	–	–	43	1
176	Kingston,	2,721	–	–	–	–	–	1	–	–	1	–	18	2
177	Wilbraham,	2,719	–	–	–	–	–	–	–	–	–	–	6	–
178	Lancaster,	2,710	–	–	–	–	7	–	–	–	1	–	90	1
179	Sharon,	2,634	1	–	4	–	2	–	–	–	–	–	70	–
180	Norton,	2,632	–	–	–	–	1	–	1	–	–	–	–	2
181	Weston,	2,587	–	–	4	–	6	–	–	–	–	–	54	1
182	Sutton,	2,569	–	–	5	–	1	–	–	–	–	–	76	–
183	Groton,	2,520	2	–	25	–	2	–	–	–	–	–	28	1
184	Groveland,	2,507	1	–	5	–	2	1	–	–	–	–	54	1
185	Hopkinton,	2,500	1	–	–	–	–	1	–	–	–	–	7	2
186	Towns under 2,500.	*206,109*	*23*	*5*	*251*	*1*	*155*	*12*	*3*	*2*	*2*	–	*2288*	*88*
187	Hull,	2,483	3	1	7	–	6	–	–	–	–	–	32	2
188	Rehoboth,	2,465	–	–	–	–	–	–	–	–	–	–	23	2
189	Charlton,	2,401	–	–	2	–	3	–	–	–	–	–	1	–
190	Shirley,	2,366	–	–	–	–	2	–	–	–	–	–	1	–
191	Ashland,	2,343	–	–	10	–	4	–	–	–	–	–	13	2
192	East Longmeadow,	2,340	–	–	–	–	1	–	–	–	–	–	2	1
193	Avon,	2,320	–	–	5	–	2	–	–	–	–	–	–	2
194	Harwich,	2,246	–	–	3	–	7	–	–	–	–	–	19	1
195	Bellingham,	2,219	–	–	–	–	1	–	1	–	–	–	1	1
196	Douglas,	2,206	–	–	4	–	2	–	–	–	–	–	3	2
197	Acton,	2,167	–	–	2	–	1	–	–	–	–	–	26	–
198	Duxbury,	2,165	–	–	2	–	–	–	–	–	–	–	–	3
199	Georgetown,	2,162	1	–	–	–	–	–	–	–	–	–	30	1
200	Williamsburg,	2,103	–	–	–	–	5	–	–	–	–	–	11	1
201	Belchertown,	2,072	–	–	–	–	2	–	–	–	–	–	–	–
202	Southborough,	2,059	5	1	–	–	–	–	–	–	–	–	3	1
203	Rutland,	2,052	1	–	–	–	–	–	–	–	–	–	–	–
204	Millville,	2,036	–	–	–	–	–	–	–	–	–	–	–	–
205	Hamilton,	2,014	–	–	2	–	–	–	1	–	–	–	24	2
206	Ashburnham,	2,007	1	–	–	–	–	–	–	–	–	–	116	–
207	Upton,	2,000	–	–	–	–	–	–	–	–	–	–	–	–
208	Merrimac,	1,997	–	–	10	–	7	1	–	–	–	–	41	–
209	Sherborn,	1,977	–	–	2	–	2	–	–	–	–	–	–	–
210	Northfield,	1,928	–	–	–	–	–	–	–	–	–	–	–	2
211	Colrain,	1,922	–	–	12	–	2	–	–	–	–	–	1	3
212	Sheffield,	1,909	–	–	–	–	2	–	–	1	–	–	17	–
213	Brookfield,	1,908	–	–	23	–	–	–	–	–	–	–	192	3
214	Raynham,	1,898	–	–	1	–	–	–	–	–	–	–	–	2
215	Longmeadow,	1,886	1	–	8	–	1	–	–	–	–	–	15	1
216	Northborough,	1,885	–	–	3	–	2	–	–	–	–	–	9	–
217	Stockbridge,	1,869	–	–	2	–	–	–	–	–	–	–	21	–
218	Townsend,	1,864	–	–	–	–	–	–	–	–	–	–	61	1
219	Freetown,	1,861	–	–	–	–	1	1	–	–	–	–	10	–
220	Lakeville,	1,855	–	–	–	–	2	–	–	–	–	–	18	–
221	Wayland,	1,851	–	–	–	–	3	1	–	–	–	–	11	1
222	Westminster,	1,844	–	–	–	–	–	–	–	–	–	–	25	1
223	Lunenburg,	1,834	–	–	3	–	–	–	–	–	–	–	24	–

to the Public Health, 1920 — Continued.

92 Lobar Pneumonia.		6 Measles.		19C Mumps.		38A Ophthalmia Neonatorum.		7 Scarlet Fever.		28-29 Tuberculosis, Pulmonary.		30-35 Tuberculosis, Other Forms.		1 Typhoid Fever.		8 Whooping Cough.		38C Gonorrhea.		37 Syphilis.		
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Line No.
2	3	21	–	1	–	–	–	–	–	2	2	–	–	1	–	12	–	1	–	–	–	164
–	1	30	–	–	–	–	–	3	–	2	1	–	–	–	–	–	–	–	–	–	–	165
–	3	11	–	6	–	–	–	–	–	3	2	–	–	–	–	–	1	1	–	–	–	166
1	2	2	–	37	–	–	–	2	–	1	1	1	1	2	1	3	–	6	–	–	–	167
4	1	6	–	–	–	–	–	2	–	6	10	–	–	–	–	–	–	–	–	1	2	168
4	2	7	–	1	–	–	–	8	–	–	2	–	–	–	–	2	1	–	–	1	1	169
2	–	3	–	1	–	–	–	6	–	1	–	–	–	2	1	5	–	5	–	–	–	170
2	1	32	–	1	–	2	–	23	–	2	–	–	–	–	–	–	–	–	–	–	–	171
–	2	12	–	8	–	–	–	8	–	4	1	–	–	1	–	1	–	2	–	–	–	172
3	2	1	–	–	–	–	–	8	–	3	4	–	–	–	–	–	–	–	–	–	–	173
–	1	–	–	–	–	1	–	14	–	1	2	1	–	–	–	–	–	–	–	–	–	174
4	1	8	–	–	–	3	–	4	–	6	2	–	–	–	–	10	–	2	–	2	–	175
–	3	–	1	–	–	–	–	2	–	1	–	–	1	2	1	–	–	1	–	–	–	176
–	–	–	1	1	–	–	–	2	–	2	5	–	–	–	–	–	–	2	–	–	–	177
14	–	11	–	11	–	1	–	22	–	9	–	1	–	–	–	3	–	13	–	5	–	178
–	–	85	–	3	–	–	–	17	–	7	6	–	–	1	–	2	–	3	–	1	–	179
–	–	1	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	2	–	–	1	180
10	–	15	–	56	–	–	–	3	–	1	1	–	1	–	–	9	–	–	–	–	–	181
4	2	8	–	–	–	–	–	12	–	5	–	–	–	1	–	1	1	3	–	–	–	182
7	2	39	–	3	–	–	–	–	–	1	1	–	–	–	–	49	–	–	–	1	–	183
3	1	6	–	36	–	2	–	1	–	2	–	–	–	–	–	64	–	1	–	–	–	184
1	–	20	–	4	–	–	–	3	–	1	4	–	–	1	–	1	–	–	–	–	–	185
103	*113*	*1550*	*5*	*294*	–	*11*	–	*375*	*2*	*135*	*405*	*9*	*18*	*20*	*1*	*461*	*19*	*99*	–	*32*	*1*	186
1	2	7	1	6	–	–	–	7	–	1	2	–	–	2	1	39	–	–	–	–	–	187
1	1	–	–	–	–	–	–	–	–	1	–	–	–	–	–	5	–	–	–	–	–	188
–	1	1	–	–	–	–	–	–	–	–	–	–	–	1	–	–	1	–	–	–	–	189
6	2	9	–	9	–	–	–	33	–	2	1	1	–	–	–	4	–	–	–	–	–	190
–	3	5	–	2	–	1	–	2	–	–	1	–	–	–	–	40	1	3	–	2	–	191
–	1	5	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	192
1	–	82	–	–	–	–	–	1	–	4	2	–	–	–	–	14	–	1	–	–	–	193
–	–	11	–	–	–	–	–	–	–	3	4	–	–	2	–	–	–	1	–	2	–	194
–	1	1	–	–	–	–	–	–	–	3	2	–	1	–	–	–	–	–	–	–	–	195
1	2	19	–	3	–	–	–	2	–	3	–	–	–	–	–	10	–	–	–	–	–	196
–	1	136	–	–	–	–	–	3	–	–	–	–	–	–	–	6	–	–	–	–	–	197
–	1	40	–	3	–	–	–	–	–	1	1	–	–	–	–	15	–	1	–	–	–	198
–	1	1	–	3	–	–	–	5	–	1	2	–	–	–	–	–	–	1	–	–	–	199
–	–	5	–	2	–	–	–	–	–	4	1	–	–	–	–	3	1	–	–	–	–	200
–	1	21	–	–	–	–	–	13	1	–	–	–	–	–	–	–	–	–	–	–	–	201
–	–	16	–	1	–	–	–	2	–	–	–	–	1	–	–	–	–	1	–	–	–	202
–	1	1	–	1	–	–	–	1	–	–	75	–	–	–	–	–	–	–	–	–	–	203
–	1	–	–	–	–	–	–	3	–	–	1	–	1	1	–	–	–	–	–	–	–	204
–	–	4	–	1	–	–	–	5	–	–	–	–	2	–	–	1	–	2	–	–	–	205
–	–	–	–	2	–	–	–	4	–	1	2	–	1	–	–	2	–	–	–	–	–	206
4	1	–	–	–	–	–	–	2	–	2	–	–	1	–	–	1	1	1	–	–	–	207
–	–	12	–	1	–	1	–	2	–	3	1	–	1	–	–	5	–	4	–	–	–	208
–	1	7	–	2	–	2	–	7	–	3	–	–	1	–	–	20	1	44	–	20	–	209
–	–	75	–	3	–	–	–	5	1	1	1	–	–	–	–	–	–	–	–	–	–	210
3	3	30	1	–	–	–	–	28	–	1	2	–	–	1	–	1	–	1	–	–	–	211
–	–	10	–	–	–	–	–	–	–	1	1	–	1	–	–	–	–	–	–	–	–	212
1	–	–	–	1	–	–	–	6	–	1	1	–	–	–	–	22	–	–	–	–	–	213
–	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	214
1	1	38	–	2	–	–	–	9	–	3	1	–	1	–	–	3	–	–	–	–	–	215
2	–	20	–	–	–	–	–	6	–	2	–	–	–	1	–	8	1	–	–	–	–	216
3	2	10	–	–	–	–	–	5	–	1	–	–	–	–	–	9	–	–	–	–	–	217
–	–	35	–	–	–	–	–	–	–	1	2	–	–	–	–	–	–	–	–	1	–	218
2	1	5	–	1	–	2	–	–	–	3	2	–	–	–	–	–	–	–	–	–	–	219
–	–	4	–	–	–	1	–	–	–	1	133	–	–	–	–	–	–	–	–	–	–	220
1	1	–	–	–	–	–	–	6	–	–	–	–	–	–	–	–	–	–	–	–	–	221
2	1	62	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	2	–	–	–	222
–	–	9	–	56	–	2	–	4	–	4	2	–	–	–	–	12	1	–	–	–	–	223

Cases and Deaths from Diseases Dangerous

Line No.	Cities and Towns grouped in Order of Population.	Population estimated as of July 1, 1920.	63A Anterior Poliomyelitis.		19A Chicken Pox.		9 Diphtheria.		61A Ep. Cerebrospinal Meningitis.		19B German Measles.		10 Influenza.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
224	Salisbury,	1,779	–	–	–	–	1	–	–	–	–	–	7	–
225	Chatham,	1,776	–	–	–	–	4	–	–	–	–	–	23	–
226	Carver,	1,742	–	–	–	–	1	1	–	–	–	–	–	–
227	Essex,	1,735	–	–	–	–	16	3	–	–	–	–	22	–
228	Hanson,	1,734	–	–	–	–	–	–	–	–	–	–	–	3
229	Norwell,	1,724	2	–	–	–	2	–	–	–	–	–	8	–
230	Southwick,	1,724	–	–	2	–	2	1	–	–	–	–	–	–
231	Dennis,	1,723	–	–	3	–	1	–	–	–	–	–	14	–
232	Marshfield,	1,710	1	–	–	–	–	–	–	–	–	–	1	1
233	Newbury,	1,704	–	–	6	–	3	–	–	–	–	–	15	1
234	Westwood,	1,636	–	–	–	–	–	–	1	1	–	–	–	–
235	Nahant,	1,600	2	1	–	–	5	–	–	–	–	–	19	1
236	Rowley,	1,600	–	–	–	–	1	–	–	–	–	–	–	2
237	Norfolk,	1,590	–	–	–	–	1	–	–	–	–	–	–	–
238	West Newbury,	1,587	–	–	3	–	1	–	–	–	–	–	91	–
239	Cheshire,	1,565	–	–	–	–	–	–	–	–	–	–	–	2
240	Buckland,	1,564	–	–	–	–	–	–	–	–	–	–	1	–
241	North Reading,	1,536	–	–	–	–	3	–	–	–	–	–	2	–
242	Sunderland,	1,518	–	–	–	–	–	–	–	–	–	–	10	–
243	Marion,	1,513	–	–	8	–	–	–	–	–	–	–	95	1
244	Bedford,	1,505	–	–	–	–	–	–	–	–	–	–	27	–
245	Oak Bluffs,	1,496	–	–	–	–	3	–	–	–	–	–	32	–
246	Middleton,	1,495	1	–	5	–	–	–	–	–	–	–	–	–
247	Millis,	1,488	–	–	–	–	–	–	–	–	–	–	–	–
248	Mattapoisett,	1,476	–	–	11	–	–	–	–	–	–	–	48	–
249	Shelburne,	1,468	–	–	–	–	–	–	–	–	–	–	–	–
250	Tisbury,	1,459	–	–	–	–	6	–	–	–	–	–	121	–
251	Lincoln,	1,451	–	–	–	–	–	–	–	–	–	–	–	–
252	Sterling,	1,450	–	–	–	–	–	–	–	–	–	–	43	5
253	Plainville,	1,434	–	–	–	–	2	–	–	–	–	–	–	1
254	Yarmouth,	1,410	–	–	–	–	–	–	–	–	–	–	47	1
255	Hinsdale,	1,403	–	–	–	–	–	–	–	–	–	–	–	1
256	Whately,	1,400	–	–	1	–	–	–	–	–	–	–	–	–
257	Huntington,	1,378	–	–	–	–	–	–	–	–	–	–	17	1
258	West Boylston,	1,370	–	–	2	–	1	–	–	–	–	–	13	–
259	Edgartown,	1,365	–	–	–	–	–	–	–	–	–	–	50	–
260	Pembroke,	1,337	–	–	–	–	–	–	–	–	–	–	–	2
261	Lynnfield,	1,321	–	–	–	–	1	–	–	–	–	–	–	–
262	Chester,	1,308	–	–	–	–	–	–	–	–	–	–	–	–
263	Sandwich,	1,304	–	–	1	–	2	–	–	–	–	–	5	–
264	Sudbury,	1,295	–	–	–	–	–	–	–	–	–	–	–	–
265	West Stockbridge,	1,282	–	–	–	–	–	–	–	–	–	–	–	–
266	Sturbridge,	1,264	–	–	–	–	–	–	–	–	–	–	5	–
267	Orleans,	1,259	–	–	2	–	1	–	–	–	–	–	34	1
268	Russell,	1,250	–	–	–	–	1	–	–	–	–	–	16	–
269	West Brookfield,	1,247	–	–	–	–	–	–	–	–	–	–	4	–
270	Lanesborough,	1,235	–	–	–	–	2	–	–	–	–	–	–	1
271	Rochester,	1,233	–	–	–	–	5	–	–	–	–	–	16	–
272	Littleton,	1,229	–	–	10	–	1	–	–	–	–	–	118	1
273	Conway,	1,210	–	–	–	–	–	–	–	–	–	–	2	2
274	Dover,	1,208	–	–	–	–	–	–	–	–	–	–	–	–
275	Erving,	1,189	–	–	10	–	–	–	–	–	–	–	1	–
276	Harvard,	1,177	–	–	1	–	2	–	–	–	–	–	13	–
277	Topsfield,	1,173	–	–	–	–	4	–	–	–	–	–	56	–
278	Stow,	1,138	–	–	–	–	–	–	–	–	–	–	–	1
279	Wenham,	1,130	–	–	–	–	2	–	–	–	–	–	–	2
280	Tyngsborough,	1,112	1	1	34	–	–	–	–	–	–	–	48	1
281	Hubbardston,	1,095	–	–	–	–	2	2	–	–	–	–	1	–
282	Southampton,	1,033	–	–	–	–	–	–	–	–	–	–	–	–
283	Ashfield,	1,030	–	–	–	–	–	–	–	–	–	–	15	–
284	Clarksburg,	1,016	–	–	–	–	–	–	–	–	–	–	1	–
285	Brimfield,	1,006	–	–	2	–	–	–	–	–	–	–	–	–
286	Mendon,	990	–	–	–	–	–	–	–	–	–	–	7	–

to the Public Health, 1920 — Continued.

92 Lobar Pneumonia.		6 Measles.		19C Mumps.		38A Ophthalmia Neonatorum.		7 Scarlet Fever.		28-29 Tuberculosis, Pulmonary.		30-35 Tuberculosis, Other Forms.		1 Typhoid Fever.		8 Whooping Cough.		38C Gonorrhea.		37 Syphilis.		
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Line No.
–	–	4	–	29	–	–	–	–	–	–	1	–	–	–	–	–	1	–	–	–	–	224
–	3	1	–	–	–	1	–	5	–	–	3	–	–	–	–	–	–	–	–	4	–	225
–	1	–	–	–	–	–	–	13	–	–	–	–	–	–	–	–	1	–	–	–	–	226
–	–	14	–	–	–	–	–	6	–	2	–	–	–	–	–	–	–	2	–	–	–	227
–	1	–	1	–	–	–	–	9	–	8	43	–	–	–	–	–	–	–	–	–	–	228
–	1	30	–	1	–	–	–	6	–	1	–	–	–	–	–	26	1	–	–	–	–	229
1	–	25	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	230
1	–	19	–	–	–	–	–	3	–	5	–	–	–	–	–	–	–	1	–	–	–	231
2	–	61	–	1	–	–	–	4	–	4	–	–	–	–	–	5	–	2	–	–	–	232
2	2	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	233
–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	234
–	–	1	–	–	–	–	–	4	–	–	–	–	1	2	–	7	1	1	–	1	1	235
–	1	2	–	–	–	–	–	–	–	–	1	–	–	1	–	–	–	–	–	–	–	236
–	1	12	–	–	–	–	–	5	–	–	–	–	–	–	–	–	–	–	–	–	–	237
4	–	5	–	5	–	–	–	–	–	1	3	–	1	–	–	–	–	–	–	–	–	238
–	–	2	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–	1	–	–	–	239
1	–	–	–	1	–	–	–	2	–	6	3	–	–	1	–	1	–	–	–	–	–	240
–	1	–	–	–	–	–	–	2	–	–	51	–	–	–	–	–	–	2	–	–	–	241
–	–	3	–	–	–	–	–	1	–	–	2	1	–	–	–	12	–	–	–	–	–	242
7	3	141	–	3	–	–	–	2	–	1	–	–	–	–	–	35	2	–	–	–	–	243
3	–	13	–	–	–	–	–	2	–	3	–	–	–	–	–	4	–	–	–	–	–	244
2	1	3	–	1	–	–	–	27	–	1	–	–	–	–	–	3	–	4	–	–	–	245
–	–	6	–	–	–	–	–	5	–	2	–	–	1	–	–	–	–	–	–	–	–	246
–	1	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	247
3	1	12	–	24	–	–	–	–	–	–	–	–	–	–	–	4	–	–	–	–	–	248
–	–	19	–	–	–	–	–	1	–	2	3	–	–	–	–	1	–	–	–	–	–	249
2	1	34	–	–	–	1	–	1	–	2	4	1	–	–	–	5	–	3	–	–	–	250
–	–	–	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	251
4	–	57	–	–	–	–	–	–	–	3	2	–	–	2	–	11	–	1	–	–	–	252
–	1	2	–	2	–	–	–	–	–	–	–	1	1	–	–	–	–	1	–	–	–	253
1	2	3	–	–	–	–	–	1	–	–	–	–	–	–	–	7	–	1	–	–	–	254
–	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	255
–	–	–	–	4	–	–	–	4	–	–	–	–	–	–	–	–	–	–	–	–	–	256
1	–	–	–	–	–	–	–	24	–	–	1	–	–	–	–	–	2	–	–	–	–	257
1	–	–	–	2	–	–	–	8	–	2	2	–	–	–	–	8	–	1	–	–	–	258
4	2	–	–	–	–	–	–	1	–	–	–	–	–	–	–	4	–	4	–	–	–	259
–	1	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	260
–	4	–	–	–	–	–	–	3	–	–	3	–	–	–	–	4	–	1	–	–	–	261
–	1	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	1	–	–	–	262
7	3	3	–	58	–	–	–	3	–	3	–	1	–	–	–	7	–	1	–	–	–	263
–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	264
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	265
–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	1	–	–	–	–	266
–	–	75	–	–	–	–	–	2	–	2	1	–	–	–	–	4	–	–	–	–	–	267
–	1	–	–	–	–	–	–	6	–	1	–	–	–	–	–	–	–	–	–	1	–	268
–	–	3	–	–	–	–	–	–	–	3	1	–	–	–	–	–	–	–	–	–	–	269
–	1	1	–	–	–	–	–	5	–	–	–	–	–	–	–	–	–	–	–	–	–	270
1	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	271
–	–	6	–	5	–	–	–	5	–	1	–	–	–	–	–	–	–	4	–	–	–	272
–	1	1	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	273
–	1	–	–	1	–	–	–	1	–	1	–	–	–	–	–	8	–	–	–	–	–	274
2	2	2	–	7	–	–	–	5	–	1	–	2	1	–	–	11	–	–	–	–	–	275
–	1	1	–	2	–	–	–	–	–	–	–	–	–	–	–	5	–	–	–	–	–	276
3	1	–	–	1	–	–	–	–	–	1	–	–	–	–	–	–	–	1	–	–	–	277
–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	278
–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	279
1	2	7	–	21	–	–	–	–	–	–	–	–	–	1	–	1	–	–	–	–	–	280
–	–	2	–	–	–	–	–	–	–	3	5	–	–	–	–	–	–	–	–	–	–	281
–	–	2	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	282
–	–	15	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	283
1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	284
–	–	35	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	285
–	1	1	–	–	–	–	–	3	–	–	1	–	–	–	–	1	–	–	–	–	–	286

Cases and Deaths from Diseases Dangerous

Line No.	Cities and Towns grouped in Order of Population.	Population estimated as of July 1, 1920.	63A Anterior Poliomyelitis.		19A Chicken Pox.		9 Diphtheria.		61A Ep. Cerebrospinal Meningitis.		19B German Measles.		10 Influenza.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
287	Becket,	988	–	–	–	–	–	–	–	–	–	–	100	1
288	Berkley,	970	–	–	–	–	–	–	–	–	–	–	–	1
289	Gill,	961	–	–	–	–	–	–	–	–	–	–	–	–
290	Ashby,	959	–	–	–	–	–	–	–	–	–	–	–	1
291	Charlemont,	951	–	–	–	–	–	–	–	–	–	–	–	–
292	Brewster,	940	–	–	–	–	1	–	–	–	–	–	–	–
293	Royalston,	935	–	–	1	–	–	–	–	–	–	–	54	–
294	New Marlborough,	931	1	–	–	–	1	–	–	–	1	–	55	–
295	Burlington,	918	–	–	–	–	1	–	–	–	–	–	4	–
296	Granby,	896	–	–	4	–	–	–	–	–	–	–	1	–
297	Boylston,	856	–	–	–	–	–	–	–	–	–	–	–	1
298	Wellfleet,	847	–	1	–	–	–	–	–	–	–	–	–	–
299	Bernardston,	842	–	–	–	1	–	–	–	–	–	–	–	–
300	Leverett,	831	–	–	–	–	–	–	–	–	–	–	–	–
301	Berlin,	822	–	–	–	–	–	–	–	–	–	–	–	–
302	Granville,	789	–	–	–	–	1	–	–	–	–	–	–	–
303	Princeton,	780	–	–	–	–	–	–	–	–	–	–	6	1
304	Bolton,	773	–	–	1	–	1	–	–	–	–	–	3	–
305	Enfield,	734	–	–	38	–	–	–	–	–	–	–	12	2
306	Halifax,	731	–	–	–	–	–	–	–	–	–	–	–	–
307	Boxford,	709	–	–	–	–	–	–	–	–	–	–	–	–
308	Hampden,	696	–	–	–	–	–	–	–	–	–	–	2	–
309	Petersham,	696	–	–	–	–	–	–	–	–	–	–	–	1
310	Cummington,	686	–	–	–	–	–	–	–	–	–	–	145	1
311	Dana,	686	1	–	1	–	–	–	–	–	–	–	6	–
312	Truro,	673	1	–	–	–	5	–	–	–	1	–	8	–
313	Worthington,	670	–	–	–	–	–	–	–	–	–	–	–	1
314	Plympton,	639	–	–	3	–	–	–	–	–	–	–	–	–
315	New Salem,	610	–	–	–	–	–	1	–	–	–	–	13	–
316	Egremont,	594	–	–	–	–	–	–	–	–	–	–	–	–
317	Chesterfield,	585	–	–	–	–	–	–	–	–	–	–	–	–
318	Eastham,	572	–	–	–	–	–	–	–	–	–	–	–	–
319	Hancock,	566	–	–	–	–	–	–	–	–	–	–	–	–
320	Sandisfield,	562	–	–	–	–	4	–	–	–	–	–	–	5
321	Savoy,	546	–	–	–	–	–	–	–	–	–	–	–	–
322	Pelham,	531	–	–	–	–	–	–	–	–	–	–	–	–
323	Paxton,	528	–	–	–	–	–	–	–	–	–	–	3	–
324	Blandford,	524	–	–	–	–	–	–	–	–	–	–	–	–
325	Oakham,	501	–	–	1	–	–	–	–	–	–	–	–	1
326	Warwick,	477	–	–	–	–	–	–	–	–	–	–	–	–
327	Richmond,	475	–	–	–	–	–	–	–	–	–	–	–	–
328	Florida,	459	–	–	–	–	–	–	–	–	–	–	–	–
329	West Tisbury,	446	1	–	–	–	–	–	–	–	–	–	12	–
330	New Braintree,	442	–	–	–	–	–	–	–	–	–	–	–	–
331	Westhampton,	436	–	–	–	–	–	–	–	–	–	–	–	–
332	Hawley,	432	–	–	–	–	–	–	–	–	–	–	–	–
333	Carlisle,	427	–	–	–	–	–	–	–	–	–	–	1	–
334	Heath,	420	–	–	–	–	–	–	–	–	–	–	–	1
335	Greenwich,	400	–	–	–	–	–	–	–	–	–	–	24	1
336	Rowe,	392	–	–	–	–	–	–	–	–	–	–	–	–
337	Otis,	390	–	–	–	–	–	–	–	–	–	–	–	–
338	Leyden,	365	–	–	–	–	–	–	–	–	–	–	–	–
339	Phillipston,	353	–	–	–	–	–	–	–	–	–	–	–	–
340	Monroe,	348	–	–	–	–	1	1	–	–	–	–	–	–
341	Plainfield,	344	–	–	–	–	–	–	–	–	–	–	13	–
342	Windsor,	344	–	–	–	–	–	–	–	–	–	–	–	1
343	Boxborough,	336	–	–	–	–	–	–	–	–	–	–	–	1
344	Monterey,	327	–	–	–	–	–	–	–	–	–	–	–	–
345	Wales,	327	–	–	–	–	–	–	–	–	–	–	–	–
346	Shutesbury,	318	–	–	–	–	–	–	–	–	–	–	–	–
347	Dunstable,	315	–	–	–	–	–	–	–	–	–	–	–	–
348	Goshen,	299	–	–	–	–	–	–	–	–	–	–	–	–
349	Chilmark,	294	–	–	–	–	4	–	–	–	–	–	1	–

to the Public Health, 1920 — Continued.

92 Lobar Pneumonia.		6 Measles.		19C Mumps.		38A Ophthalmia Neonatorum.		7 Scarlet Fever.		28-29 Tuberculosis, Pulmonary.		30-35 Tuberculosis, Other Forms.		1 Typhoid Fever.		8 Whooping Cough.		38C Gonorrhea.		37 Syphilis.		
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Line No.
–	–	7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	287
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	288
–	2	53	1	–	–	–	–	–	–	–	1	–	–	–	–	8	–	–	–	–	–	289
–	1	1	–	–	–	–	–	–	–	1	1	–	1	1	–	–	–	–	–	–	–	290
–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	291
1	–	8	–	1	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	292
1	–	–	–	–	–	–	–	2	–	1	–	–	–	–	–	10	–	–	–	–	–	293
–	2	39	–	–	–	–	–	10	–	–	–	–	–	1	–	–	–	–	–	–	–	294
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	295
–	–	2	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	296
–	1	1	–	–	–	–	–	–	–	4	1	–	–	–	–	–	–	–	–	–	–	297
1	1	3	–	–	–	–	–	2	–	1	1	–	–	–	–	–	–	1	–	–	–	298
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	299
–	–	1	–	3	–	–	–	1	–	–	1	–	–	–	–	–	–	–	–	–	–	300
–	2	1	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	301
–	–	–	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	302
–	1	2	–	1	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	303
–	1	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	304
–	2	1	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	1	–	–	–	305
–	4	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	306
1	–	1	–	–	–	–	–	5	–	–	–	–	–	–	–	–	–	–	–	–	–	307
1	–	–	–	–	–	–	–	3	–	1	1	–	–	–	–	–	–	–	–	–	–	308
2	–	18	–	14	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	309
4	–	11	–	–	–	–	–	–	–	–	–	–	–	–	–	5	–	1	–	–	–	310
–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	7	–	–	–	–	–	311
3	1	–	–	–	–	–	–	2	–	1	–	–	–	1	–	–	–	–	–	–	–	312
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	313
–	–	–	–	–	–	–	–	1	–	1	–	1	–	–	–	–	–	–	–	–	–	314
–	2	–	–	–	–	–	–	2	–	2	–	–	–	–	–	4	–	–	–	–	–	315
–	1	–	–	–	–	–	–	–	–	–	3	–	–	–	–	–	–	–	–	–	–	316
–	–	2	–	4	–	–	–	–	–	2	–	–	–	–	–	5	–	–	–	–	–	317
–	–	25	–	1	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	318
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	319
–	1	–	–	–	–	–	–	–	–	1	1	–	–	–	–	3	–	–	–	–	–	320
–	1	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	321
–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	322
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	323
–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	324
–	1	1	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	325
1	1	–	–	–	–	–	–	–	–	2	1	–	–	–	–	–	–	–	–	–	–	326
–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	327
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	328
–	–	14	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	329
–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	330
–	–	2	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	331
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	332
1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	333
–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	4	–	–	–	–	–	334
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	335
1	1	27	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	336
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	337
–	–	3	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	338
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	339
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	340
–	–	–	–	–	–	–	–	–	–	1	1	–	–	–	–	18	–	–	–	–	–	341
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	342
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	343
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	344
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	345
1	–	7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	346
–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	347
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	348
–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	349

Cases and Deaths from Diseases Dangerous

Line No.	Cities and Towns grouped in Order of Population.	Population estimated as of July 1, 1920.	63A Anterior Poliomyelitis.		19A Chicken Pox.		9 Diphtheria.		61A Ep. Cerebrospinal Meningitis.		19B German Measles.		10 Influenza.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
350	Middlefield,	294	–	–	–	–	–	–	–	–	–	–	–	1
351	Prescott,	278	–	–	–	–	–	–	–	–	–	–	–	–
352	Washington,	273	–	–	–	–	–	–	–	–	–	–	–	–
353	Tyringham,	271	–	–	–	–	–	–	–	–	–	–	–	–
354	Wendell,	269	–	–	–	–	2	–	–	–	–	–	–	–
355	Alford,	266	–	–	–	–	–	–	–	–	–	–	23	–
356	Mashpee,	258	–	–	–	–	–	–	–	–	–	–	–	–
357	Montgomery,	245	–	–	–	–	–	–	–	–	–	–	–	–
358	Tolland,	220	–	–	–	–	–	–	–	–	–	–	–	–
359	Gay Head,	190	–	–	–	–	–	–	–	–	–	–	–	–
360	Holland,	174	–	–	–	–	–	–	–	–	–	–	4	–
361	Gosnold,	160	–	–	–	–	–	–	–	–	–	–	–	–
362	Peru,	153	–	–	–	–	–	–	–	–	–	–	–	1
363	New Ashford,	92	–	–	–	–	–	–	–	–	–	–	–	–
364	Mount Washington,	79	–	–	–	–	–	–	–	–	–	–	–	–
65	Camp Devens,	–	–	–	1	–	–	–	–	–	–	–	3	–
366	State Infirmary, Tewksbury,	–	–	–	19	–	16	2	–	1	–	–	7	4

In addition to the above there occurred 3 cases of actinomycosis, with 1 death: —

	Cases.	Deaths.
Barnstable,	1	–
Boston,	1	1
Chelsea,	1	–

17 cases of anthrax, with 4 deaths: —

Boston,	2	–
Chelsea,	1	1
Lawrence,	1	1
Lowell,	3	1
New Salem,	–	1
Newton,	1	–
Peabody,	7	–
Stoneham,	1	–
Worcester	1	–

67 cases of dog bite (requiring anti-rabic treatment): —

Attleboro,	3	–
Barnstable,	1	–
Berkley,	2	–
Beverly,	1	–
Boylston,	3	–
Fall River,	8	–
Framingham,	3	–
Grafton,	7	–
Holden,	1	–
Holyoke,	1	–
Lowell,	9	–
Methuen,	2	–
Middleborough,	3	–
New Bedford,	3	–
North Adams,	1	–
Seekonk,	1	–
South Hadley,	1	–
Stoughton,	1	–
Taunton,	11	–
Walpole,	1	–
Westminster,	3	–
Winthrop,	1	–

37 cases of dysentery, with 26 deaths: —

	Cases.	Deaths.
Adams,	4	2
Boston,	4	3
Cambridge,	1	–
Canton,	–	1
Chicopee,	1	1
Fairhaven,	1	–
Fall River,	3	3
Fitchburg,	–	1
Haverhill,	2	–
Ipswich,	–	1
Malden,	–	1
Maynard,	–	1
Medfield,	13	–
Milford,	–	2
Montague,	1	–
New Bedford,	1	1
Newton,	1	–
North Adams,	–	3
Quincy,	1	–
Springfield,	1	1
Sterling,	3	–
Taunton,	–	1
Worcester,	–	4

2 cases of hookworm: —

Beverly,	1	–
Salem,	1	–

3 cases of leprosy, with 3 deaths: —

Boston,	2	–
Gosnold,	–	3
Lowell,	1	–

60 cases of malaria, with 5 deaths: —

Boston,	15	–
Brockton,	3	–
Cambridge,	2	–
Camp Devens,	2	–
Dedham,	4	–

to the Public Health, 1920 — Concluded.

92 Lobar Pneumonia.		6 Measles.		19C Mumps.		38A Ophthalmia Neonatorum.		7 Scarlet Fever.		28-29 Tuberculosis, Pulmonary.		30-35 Tuberculosis, Other Forms.		1 Typhoid Fever.		8 Whooping Cough.		38C Gonorrhea.		37 Syphilis.		
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Line No.
–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	350
1	–	8	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	351
–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	352
–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	353
1	1	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	354
–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	355
–	–	1	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	356
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	357
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	358
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	359
–	–	–	–	–	–	–	–	5	–	–	–	–	–	–	–	–	–	1	–	–	–	360
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	361
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	362
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	363
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	364
1	–	7	–	14	–	–	–	–	–	7	–	–	–	–	–	–	–	51	–	8	–	365
25	14	15	2	47	–	–	–	27	–	51	108	11	6	–	–	7	–	68	–	20	18	366

	Cases.	Deaths.
Deerfield,	1	–
Everett,	2	–
Fall River,	2	–
Fitchburg,	2	–
Framingham,	1	–
Haverhill,	1	–
Holyoke,	1	–
Lawrence,	2	1
Lowell,	1	1
Lynn,	1	1
Mansfield,	2	–
Marlborough,	1	–
Middleborough,	1	–
Northbridge,	7	–
Norwood,	2	–
Pittsfield,	1	1
Shelburne,	–	1
Taunton,	1	–
Walpole,	1	–
Whitman,	1	–
Winthrop,	2	–
Worcester,	1	–
16 cases of pellagra, with 14 deaths: —		
Boston,	1	–
Danvers,	4	3
Lynn,	1	1
Maynard,	–	1
Newburyport,	1	–
Northampton,	2	3
Salem,	–	1
Swampscott,	1	1
Taunton,	1	1
Waltham,	1	1
Wrentham,	3	1
Worcester,	1	1
153 cases of septic sore throat, with 29 deaths: —		
Amherst,	2	–
Arlington,	1	–

	Cases.	Deaths.
Attleboro,	2	–
Boston,	46	13
Brockton,	1	–
Brookline,	1	–
Cambridge,	1	–
Chelsea,	2	–
Clinton,	2	1
Dedham,	1	1
Edgartown,	1	–
Everett,	1	–
Fall River,	3	–
Greenfield,	–	1
Holyoke,	1	4
Lancaster,	1	–
Lawrence,	1	–
Leominster,	1	1
Lowell,	1	–
Lynn,	1	–
Malden,	–	1
New Bedford,	4	1
Newburyport,	5	–
Newton,	2	1
Northampton,	1	–
Peabody,	1	–
Plymouth,	3	–
Salem,	1	1
Saugus,	7	–
Sharon,	1	–
Somerville,	2	–
Springfield,	–	2
Sutton,	4	–
Taunton,	2	1
Waltham,	1	–
Warwick,	1	–
Westfield,	1	–
Whitman,	1	–
Winchester,	43	1
Winthrop,	1	–
Woburn,	1	–
Worcester,	1	–

29 cases of tetanus, with 21 deaths: —	Cases.	Deaths.
Boston,	4	3
Chicopee,	1	–
Danvers,	1	–
Dennis,	1	–
Easthampton,	1	–
Fall River,	4	2
Hadley,	–	1
Holyoke,	2	1
Lawrence,	1	1
Lenox,	1	–
North Adams,	1	1
Northampton,	–	1
Northbridge,	1	–
Peabody,	1	1
Pittsfield,	–	5
Quincy,	1	1
Revere,	1	–
Shirley,	1	–
Springfield,	3	4
87 cases of trachoma: —		
Athol,	1	–
Boston,	44	–
Brockton,	1	–
Cambridge,	2	–
Chelsea,	2	–
Easton,	1	–
Everett,	2	–
Fairhaven,	4	–
Fall River,	2	–
Fitchburg,	1	–
Holyoke,	1	–
Lawrence,	3	–
Lowell,	3	–
Lynn,	2	–
Malden,	2	–
Medford,	3	–
Montague,	1	–
New Bedford,	1	–
Peabody,	2	–
Somerville,	2	–
Springfield,	2	–
Taunton,	1	–
Uxbridge,	1	–
Worcester,	3	–
5 cases of trichinosis: —		
Boston,	4	–
Westfield,	1	–
29 cases of smallpox, with 1 death: —		
Boston,	9	–
Braintree,	1	1
Chicopee,	3	–
Lowell,	1	–
Methuen,	14	–
Somerville,	1	–

Cases and Deaths, with Case and Death Rates, per 100,000 Population[1] for All Reportable Diseases during the Year 1920.

Disease.	Cases.	Deaths.	Case Rate.	Death Rate.	Fatality Rate.
Actinomycosis,	3	1	.1	.0	33.3
Anterior poliomyelitis,	696	140	18.0	3.6	20.1
Anthrax,	17	4	.4	.1	23.5
Chicken pox,	5,355	11	138.4	.3	.2
Diphtheria,	7,513	595	194.2	15.4	7.9
Dog bite,	67	–	1.7	–	–
Dysentery,	37	26	1.0	.7	70.3
Epidemic cerebrospinal meningitis,	182	129	4.7	3.3	70.8
German measles,	484	–	12.5	–	–
Gonorrhea,	7,225	4	186.7	.1	.1
Hookworm,	2	–	.1	–	–
Influenza,	36,312	1,700	938.5	43.9	4.7
Leprosy,	3	3	.1	.1	100.0
Malaria,	60	5	1.6	.1	8.3
Measles,	32,141	347	830.7	9.0	1.1
Mumps,	5,962	6	154.1	.2	.1
Ophthalmia neonatorum,[2]	1,638	–	42.3	–	–
Pellagra,	16	14	.4	.4	87.5
Pneumonia, lobar,	5,558	2,781	143.6	71.9	50.0
Scarlet fever,	10,260	215	265.2	5.5	2.1
Septic sore throat,	153	29	4.0	.7	19.0
Smallpox,	29	1	.7	.0	3.4
Syphilis,	2,987	225	77.2	5.8	7.5
Tetanus,	25	21	.6	.5	84.0
Trachoma,	87	–	2.2	–	–
Trichinosis,	5	–	.1	–	–
Tuberculosis, pulmonary,	6,696	3,743	173.1	96.7	55.8
Tuberculosis, other forms,	800	639	20.7	16.5	79.9
Typhoid fever,	935	96	24.2	2.5	10.3
Whooping cough,	9,994	542	258.3	14.0	5.4
Totals,	135,242	11,277	3,495.4	291.5	8.3

[1] Corrected population used.

[2] Includes suppurative conjunctivitis.

Incidence of Communicable Diseases by Months, 1920.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
Actinomycosis,	–	–	1	–	–	–	1	–	1	–	–	–	3
Anterior poliomyelitis,	2	4	4	1	–	5	16	93	273	190	77	31	696
Anthrax,	–	1	1	1	5	1	–	1	3	2	2	–	17
Chicken pox,	968	442	374	335	429	409	185	55	61	323	651	1,123	5,355
Diphtheria,	938	640	559	471	478	586	472	428	415	744	839	943	7,513
Dog bite,	9	8	–	8	12	11	3	6	7	1	1	1	67
Dysentery,	–	–	1	–	–	1	6	22	6	–	1	–	37
Epidemic cerebrospinal meningitis.	28	22	21	11	10	7	14	12	24	12	7	14	182
German measles,	49	37	62	66	82	57	27	10	8	12	24	50	484
Gonorrhea,	598	465	523	536	615	685	707	666	619	678	532	601	7,225
Hookworm,	–	–	–	–	–	–	1	1	–	–	–	–	2
Influenza,	5,078	28,407	2,222	227	98	24	13	10	39	41	67	86	36,312
Leprosy,	2	–	–	–	–	–	–	–	–	1	–	–	3
Malaria,	4	–	1	2	1	9	14	9	8	7	5	–	60
Measles,	3,986	2,952	3,010	4,149	5,750	5,288	2,110	452	207	714	1,647	1,876	32,141
Mumps,	1,141	835	915	708	763	646	280	85	91	148	149	201	5,962

Incidence of Communicable Diseases by Months, 1920 — *Concluded.*

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
Ophthalmia neonatorum,[1]	165	105	145	122	146	167	144	116	147	128	136	117	1,638
Pellagra,	–	–	–	1	–	2	4	4	1	2	1	1	16
Pneumonia, lobar,	855	1,801	595	387	435	233	96	73	122	220	288	453	5,558
Scarlet fever,	1,714	1,079	1,223	1,358	1,216	715	337	213	287	543	658	917	10,260
Septic sore throat,	19	18	9	10	5	53	6	6	2	5	10	10	153
Smallpox,	–	–	–	–	11	–	4	–	–	–	–	14	29
Syphilis,	329	217	278	251	254	210	206	227	270	257	248	240	2,987
Tetanus,	–	–	–	3	–	4	5	4	2	3	3	1	25
Trachoma,	14	3	13	5	7	2	8	8	7	9	7	4	87
Trichinosis,	3	–	–	2	–	–	–	–	–	–	–	–	5
Tuberculosis, pulmonary,	483	451	555	697	673	640	565	469	575	555	455	578	6,696
Tuberculosis, other forms,	84	39	86	87	77	77	69	52	50	61	65	53	800
Typhoid fever,	62	22	33	44	45	63	103	116	198	127	83	39	935
Whooping cough,	1,149	888	1,142	1,089	1,168	975	910	803	529	391	388	562	9,994
Total,	17,680	38,436	11,773	10,571	12,280	10,870	6,306	3,941	3,952	5,174	6,344	7,915	135,242

[1] Includes suppurative conjunctivitis.

Division of Biologic Laboratories

Benjamin White, Ph.D., *Director*
William A. Hinton, M.D., *Assistant Director*
David L. Williams, M.D., *Assistant Director*

Report of Division of Biologic Laboratories.

Antitoxin and Vaccine Laboratory.

1. *Personnel.*

On Feb. 1, 1920, Dr. Benjamin White was appointed assistant director of the Division and placed in charge of the Antitoxin and Vaccine Laboratory. On June 1, 1920, Dr. M. J. Rosenau resigned as Director of the Division and Doctor White was appointed in his place, and Dr. David L. Williams was made assistant director.

2. *Production.*

The accompanying table, compiled from all available data, shows the amounts of the various biologic products prepared, distributed and in stock at the end of the fiscal years 1919 and 1920.

Never before in the history of the laboratory have the reserve stocks of products been as large as they are at the present time. There is practically a year's supply of diphtheria antitoxin, of antimeningococcic and antipneumococcic serum in storage, which in addition to current production insures an adequate reserve to meet any epidemic emergency.

Product.	1919.			1920.		
	Liters.	Total 1,000 Unit Doses.	Units per C. C.	Liters.	Total 1,000 Unit Doses.	Units per C. C.
1. Diphtheria antitoxin: —						
Produced,	602.28	–	–	769.1	–	–
Distributed,	646.067	143,101	221	482.	179,756	372
On hand,	72.3	–	–	232.4	–	–
2. Diphtheria plasma: —						
Produced,	–	–	–	1,126.6	–	–
Used in concentration,	–	–	–	725.	–	–
On hand,	–	–	–	569.1	–	–
3. Concentrated diphtheria antitoxin: —						
Produced,	165.95	–	–	158.6	–	–
Distributed,	109.05	16,028	147	100.73	38,471	381
On hand,	60.	–	–	55.2	60,720	1,100

Product.	1919.		1920.	
	Liters.	Total Doses.	Liters.	Total Doses.
4. Antimeningococcic serum: —				
Produced,	86.5	5,766	317.665	21,177
Distributed,	67.365	4,565	48.310	3,585
On hand,	31.	-	47.2	-
5. Antipneumococcic serum, Type I: —				
Produced,	23.800	238	147.700	1,477
Distributed,	42.200	422	44.4	444
On hand,	36.925	369.25	100.700	1,007
6. Smallpox vaccine: —				
Produced,	2.349	140,940	4.844	290,610
Distributed,	3.247	194,807	3.151	189,064
On hand,	-	-	1.624	97,440
7. Typhoid paratyphoid vaccine: —				
Produced,	112.3	112,300	73.5	73,500
Distributed,	74.123	74,123	49.191	49,191
On hand,	-	-	16.6	16,600
	Outfits.	Total Doses.	Outfits.	Total Doses.
8. Schick outfits: —				
Produced,	96	9,600	91	9,100
Distributed,	96	9,600	63	6,300
On hand,	-	-	30	3,000
	Liters.	Total Doses.	Liters.	Total Doses.
9. Diphtheria toxin-antitoxin: —				
Produced,	-	-	6.443	6,443
Distributed,	1.108	1,108	3.614	3,614
On hand,	-	-	2.829	2,829
	Liters.	Potency.	Liters.	Potency.
10. Diphtheria toxin: —				
Produced,	539.	.006	539.	.0025
Used,	583.	.006	456.	.0025
On hand,	20.	.006	83.	.0025

These large supplies are due to two factors, one of which is the increased amounts of blood yielded by the horses, and the other is increased potency of all serums due to improvements in the methods of immunization. For example, the horses producing diphtheria antitoxin are now producing serum containing nearly twice as many units per cubic centimeter as the serum produced in 1919. The higher potency of the serum at present produced enables physicians to administer the proper number of units of antitoxin to the patient in about one-half the previous volume of fluid. The therapeutic efficiency of the serum is accordingly greatly enhanced. In addition, the horses are yielding from 30 to 40 per cent more serum. It is therefore possible with the same number of horses to produce more than twice

the total number of diphtheria units formerly produced, and the cost per 1,000 units is approximately halved.

Changes in the procedure of vaccinating calves for the production of smallpox vaccine virus have increased the yield from each calf from 60 to over 100 per cent. This means that the present yearly supply of nearly 200,000 doses can be produced from about two-thirds the usual number of calves, thereby reducing the cost of vaccine virus proportionately.

3. *Economics.*

Owing to the increased distribution of products and the prevailing high prices of all apparatus and supplies, the last annual appropriation for this laboratory barely covered the current expenses, and left no funds available for many urgently needed improvements. On account of the insufficient funds available and for the purpose of preparing and distributing the largest possible quantity of products at the lowest possible unit cost, many economies have been instituted and practiced. All supplies have been standardized, thereby reducing the number of articles on the stock list, and they have been purchased in quantity and usually on competitive bids. A considerable saving in the expense account has therefore been effected.

4. *Improvements.*

A new system of bookkeeping and of stock production and distribution records is being installed which conforms with modern business systems, and whereby it is possible to make a more accurate and accessible accounting of expenditures, equipment on hand, of production and finally of the production costs of each product. A full time clerk-stenographer has been added to the staff, who acts as chief clerk for the Division in addition to keeping all office records. This change relieves the trained laboratory assistants of clerical duties and enables them to devote their whole time to production.

5. *Educational.*

The teaching activities of the laboratory have been greatly expanded during the past year. Instruction in immunity, both theoretical and applied, and demonstrations of the preparation and use of biologic products have been given to more than 300 persons, comprising groups from medical societies, from medical and technical schools and colleges, as well as individual physicians, nurses, public health workers and students.

Although such lectures and demonstrations cause considerable inconvenience, they constitute one of the most valuable functions of the laboratory. It is the intention of the Director to welcome all such classes, any medical societies and interested individuals, because in such a way we can not only acquaint the medical profession and public health workers of the Commonwealth with the details of the production of biologic products, but we can also stimulate a more lively and widespread interest in the application of these products in the diagnosis, prevention and treatment of infectious diseases.

6. *Needs.*

(*a*) *Personnel.* — The present staff is too small to perform the added work entailed by the increased production. In the estimate already submitted for the 1921 budget, a request was made for one more laboratory assistant, Grade I. Since this estimate was submitted, however, it has been found necessary to increase further the personnel. If this laboratory is to meet the requirements of the Hygienic Laboratory of the United States Public Health Service, under whose license the products are prepared and distributed, it will be necessary to concentrate all diphtheria antitoxin. This process involves constant and careful attention and warrants the employment of a full-time laboratory assistant. It is desirable that a chemist be obtained for this work, who could also assist in other processes in the laboratory, especially during vacation seasons. In addition to this, if the new regulations of the Hygienic Laboratory are to be complied with in all details, it will be necessary to add to the staff another trained bacteriologist. Furthermore, although the main function of such a laboratory as the Antitoxin and Vaccine Laboratory is the production of biologic products for the needs of the Commonwealth, it is also well within its scope to investigate and develop new methods, not only for the improvement of its present products but also for the production of new biologic agents. The procedures as now carried out in the immunization of horses and in the preparation and testing of antitoxin and other serums and vaccines should be made to yield scientific dividends in the way of new and useful data. The present burden of work carried by the employees of the present staff makes it impossible to take advantage of this exceptional opportunity, but with the addition of these two assistants some of the facilities offered might be utilized to good advantage.

(*b*) *Funds.* — The increased appropriation requested in the estimate for the 1921 budget is required not only to meet the increased over-

head charges but also to replace many antiquated and worn-out items of apparatus and equipment, and also to provide for the heavy expenses incident to the more elaborate tests required by the Federal government.

(*c*) *Laboratory Accommodations.* — The buildings in which the activities of the Antitoxin and Vaccine Laboratory are now housed are inadequate for the number of workers and the volume of work done. If the laboratory's activities are to expand even at the present rate, it soon will be necessary either to enlarge and add to the present buildings or to provide suitable accommodations elsewhere. The buildings now occupied are not the property of the Commonwealth but are leased from the Bussey Institution of Harvard University. Under the present circumstances it is not advisable to carry out many of the urgent improvements, and it is also impossible at present to enlarge the buildings to accommodáte the workers and the work.

The problem of providing for the expansion and permanent housing of the laboratory's activities is soon to be met and it is now being studied in all its aspects.

Wassermann Laboratory.

1. *Routine Tests.*

During the past year the activities of the Wassermann Laboratory have been confined to the execution of tests established during the previous years. Its personnel has not changed in number, but the volume of its work shows a noteworthy increase over that of 1919, as indicated in the following table: —

	1916.	1917.	1918.	1919.	1920.
Wassermann tests, ...	25,497	28,524	27,534	31,485	36,953
Gonococcus fixation tests, ...	–	–	–	222	1,726
Diagnostic examinations for Division of Animal Industry: —					
(*a*) Complement fixation tests for glanders,	985	1,330	646	122	221
(*b*) Examinations for rabies, . . .	47	67	61	84	166
(*c*) Pathologic and bacteriologic examinations.	10	3	45	79	64

2. *Complement Fixation Tests in Tuberculosis.*

In addition to performing the increasing number of routine tests, an investigation has been carried on to determine the utility of the complement fixation test as a clinical aid in the diagnosis of tuberculosis.

The various methods advocated by other workers as well as several original modifications have been studied. This investigation indicates that in its present stage of development the complement fixation test in tuberculosis does not possess sufficient diagnostic or prognostic value to be used as an aid in the clinical determination of tuberculosis.

3. *Complement Fixation Tests in Gonococcal Infections.*

During the past year the gonococcus fixation test has been utilized to some extent as a clinical aid in the diagnosis of gonococcal infections. Its chief use has been in the determination of "cures," and hence, in a decision, as to the communicability of the disease. The demand for this test has not been as great as was expected, although many of the best clinicians value it as an aid in obscure cases.

No small part of the work of the laboratory consists in the preparation of standardized amboceptor and standardized antigen, which is distributed to municipal, public health and hospital laboratories in the State for use in Wassermann testing.

4. *Costs.*

The careful economy practiced during the past year is apparent when it is stated that the cost of Wassermann examinations was 25 cents per test during the present fiscal year and that this cost includes the overhead of statistical investigations. The cost in 1916 was a fraction less than 20 cents, but in that year the amount included no charge for statistical investigations, and the scale of salaries and the price of supplies were on a much lower level than during the present year.

Division of Hygiene

Merrill E. Champion, M.D., *Director*

Report of Division of Hygiene.

Changes in Personnel.

During the year just past there has been a great increase in the scope of the Division's work, together with a shrinkage in the size of its personnel. We have gained a clinic physician and a health instructor in mouth hygiene and lost a chief of the Subdivision of Public Health Nursing, together with two nurse health instructors. The Division is at present badly undermanned.

In March, 1920, Miss Blanche Wildes, chief of the Subdivision of Public Health Nursing, resigned to accept a position with the New England Division of the American Red Cross. In September, 1920, Miss Hazel Wedgwood and in October Miss Harriet Wedgwood resigned as health instructors to accept much more lucrative positions with the Red Cross in other States. The loss of these three experienced and efficient workers at the height of their usefulness to the State, because of the poor salaries paid by this State, is most unfortunate.

In April, 1920, Miss Evelyn C. Schmidt, who had already been with us as a temporary appointee as health instructor in mouth hygiene, was made a permanent employee. In June Dr. Mary Putnam, who likewise had been with us previously as a temporary appointee, was appointed clinic physician on a permanent basis.

In November, 1920, Dr. Edwin N. Kent, who had given valiant and gratuitous service as supervisor of mouth hygiene, resigned this position and was appointed consultant in mouth hygiene.

In March Miss Josephine M. Cullen resigned as stenographer to accept a position in the office of a practicing physician. Miss Winifred A. McPeake was appointed to the position of junior stenographer in April, 1920, and Miss Anna E. Curran was employed in a similar position in September, 1920.

Lines of Work.

The work of the Division for the past year will be discussed under headings indicating the different activities which are being carried on.

Investigations.

During the year 1919–20 two extensive pieces of investigation were carried on by nurse health instructors in the Division of Hygiene. One of these dealt with the present status of the midwife in Massachusetts. A group of nine cities and towns was chosen in which to make the study. The basis of choice was that the population of the communities should be representative of the different races present in any number in this State. Consequently, a study was made of conditions as they existed at that time in Boston, Fall River, Brockton, Fitchburg, Springfield, Barre, Pittsfield, Provincetown and Westfield. The nurses making the investigation were thoroughly experienced in that type of work.

It will be recalled that, according to law, in Massachusetts the midwife has no standing except that she is obliged to report the births she attends. On the other hand, if she attends any births, she is liable to prosecution for practicing medicine without a license. It would seem as if prohibition of this sort would be sufficient to drive the midwife out of the State. As a matter of fact, however, diligent inquiry in the nine cities and towns mentioned uncovered the presence of 117 midwives. Without any question there are others practicing there who were not found. The midwife is an important factor in the confinement of the mother of foreign birth, the reasons for this fact being that these women are accustomed to having a midwife in the home country and also prefer a midwife because she combines housework with medical care, all for a comparatively reasonable fee.

Much of the information obtained during this investigation came only in a roundabout way and some of it came in confidence. Many of the midwives visited were apparently making an honest attempt to carry on their work in a cleanly manner; others were not of a sufficiently high type to recognize the need of cleanliness. Probably it may be said with justice, however, that as a result of legal restriction the tendency has been for the poorer midwife rather than the better one to survive as the former is more willing to take chances with the law. The results of the work of the midwife as measured by mortality statistics were reasonably good in the cities and towns studied. As a matter of fact, however, too much reliance cannot be placed upon this because the midwife when in difficulty generally falls back upon some physician to help her out, and also because there are no statistics available on the morbidity which may result from the practice of the midwife.

It is difficult to say at present just what change should be made in

existing practice as regards midwives. It certainly can hardly be considered an ideal arrangement to have a poorly trained individual handling obstetrics. She is useful only because a certain group insists upon having her and also because she does, in a certain measure, solve the problem of caring for the family at the time of the mother's confinement. More maternity clinics, some arrangement for providing those willing to do housework, and education of the foreign-born mother as to the need of the best possible medical care at the time of her confinement, represent probably the most satisfactory, though of necessity, a slow solution of the midwife problem.

A second investigation undertaken last year by the Division was one into the open-air school problem of the State. All such schools in Massachusetts were visited, their methods of procedure studied, and the results collected so far as was possible. Questionnaires sent to similar institutions in other States furnished a basis for comparison. It was hoped that possibly some standards might be evolved which would enable us to estimate with some degree of assurance the number of children in a given community who should be in such special schools and also the probable cost of such care. We have come to the conclusion, however, that much more work is necessary throughout the country on this problem before any such standards can be formulated.

Food and its Relationship to Health.

The nutrition work of this Division has been increasing very rapidly during the year which has just passed. The demands upon the time of our health instructor in foods have increased in two directions. On the one hand, communities throughout the State have been asking with increasing frequency for talks to school children and to groups of adults interested in a general way in the problem of food and its relationship to health. On the other hand, there has been an increasing number of consultations with this Department with regard to the establishment of new pieces of nutrition work, either under the auspices of some municipality or under private agencies. The work has thus grown to such an extent that one person is no longer able to handle it. The advice to towns and to private agencies is, of course, the more important phase of the work in that it means the extension of the educational facilities to a larger group of people. For this reason the assistance we have given to cities and towns in the way of talks on food will have to be curtailed unless our force is augmented.

During the past year an advisory committee on nutrition was formed, made up of representatives of the larger organizations interested in this subject. Several meetings of this committee were held

and much discussion ensued which proved to be helpful in the Department's work.

A special edition of our bimonthly bulletin, "The Commonhealth," has been issued which is devoted to setting forth the different phases of the nutritional problem and the way in which it is being handled by the different interested agencies in the State.

Mouth Hygiene.

Educational work along the lines of mouth hygiene has been developing with startling rapidity. Although a comparatively new movement, it apparently has made an appeal to the public imagination far in excess of that made by other phases of public health work which have been for a much longer period before the public eye. The Division of Hygiene began its activities in this field last year with the appointment of a public-spirited dentist as supervisor of mouth hygiene. The service rendered the State in this instance was gratuitous but of the greatest value. An advisory committee on dental hygiene was also established, consisting of a group of well-known dentists whose interest in the preventive side of dentistry is sufficient to make them willing to serve on such a committee. Later in the year a temporary appointment was made of a health instructor in mouth hygiene. This position proved to be of such value that an appropriation was secured in 1920 which enabled us to make this a permanent appointment.

In mouth hygiene, as in nutrition, the first step taken was in the direction of talks and literature designed to reach the general public and to inform it as to the importance of the care of the mouth and teeth. The health instructor in mouth hygiene visited many cities and towns, talking to the school children and speaking before adult audiences. Various pamphlets on the subject were written and distributed in very large numbers. A letter was prepared to be read in all the schools in order to reach in a more personal way the many thousands of school children in the State. A dental hygiene exhibit was prepared which has been shown at fairs and during health weeks.

The second phase of the work has now been reached. The demand for lectures continues as great as ever and in addition we are receiving an increasing number of calls for expert advice as to the best ways of starting dental work in the different cities and towns. It is easy to see that if we are to furnish this advice and if we are to keep up with the duty of preparing new written material from time to time, we must have the services of at least one person for this work alone. For this reason a second health instructor in mouth hygiene is being asked for this year.

Clinics for the Child in the Rural Community.

During the agricultural fair season of 1919, as mentioned in my last annual report, an attempt was made on a small scale to reach the child in the rural districts through the offer of free medical examination by a competent pediatrician. It was felt that the results of this experiment justified the extension of the work. An appropriation was obtained for 1920 to place this activity upon a permanent basis. One clinic physician was appointed, and a tentative plan was made to cover the more inaccessible parts of the State during the summer and fall. Two objects were kept in view: to paint a comprehensive picture of the actual conditions under which the country child grows up and the result as seen in the child, and to arouse local interest in improving these conditions.

The clinic physician started in June, 1920, to carry out this program. The Berkshires were selected as representing the most isolated farming district. An additional fact of great interest was that here could be found a chance to study the conditions under which our country children of native stock live. A few weeks were spent at the inception of the work in visiting the small towns of this territory, making calls upon local physicians, teachers, school boards and others to explain what we had in mind and particularly to emphasize that our work was intended to be preventive rather than curative. Many of the larger towns were also visited in order to determine the hospital and dispensary facilities which might be useful to those found in need of such service. Real co-operation was obtained from many, particularly farm bureaus, the Red Cross and school authorities. There was very little antagonism on the part of any one, although, as was naturally to be expected, the majority of those reached were rather indifferent, probably because of the novelty of the undertaking.

These rural clinics were conducted in as simple a manner as possible. The examinations were thorough, but the use of expensive accessories was discouraged. Instead of using an automobile fitted up as a clinic, the local schoolhouse or similar building was used. It was intended that the community should be impressed in every way possible with the fact that nothing was being done which they might not reasonably hope to duplicate. Our purpose from the very start was to show the community the existing need for better supervision of the health of its children and to show them how such supervision could best be carried out by themselves with what assistance in advice and demonstration the State could give. In every instance where the children were examined, an attempt was made to have the parents present in order

that the facts discovered might be discussed with them. If defects were found which called for treatment, the case was at once referred to the family physician if there were one. Where public health nurses were available they were urged to follow up the children who were shown to be suffering from defects in order that they might aid the parents to have these defects corrected.

Most of the school examinations were made in the entry way of one-room school buildings, the door into the schoolroom being closed for privacy and the door overlooking the hillside being left open for light and air. The children were dismissed from class one at a time without interrupting the school routine, and examined as completely as was possible under such conditions. Posture, nutrition, musculature, osseous system and any deformities were noted. Heart and lungs were gone over and the possibility of abdominal disease was kept in mind. Then the head, eyes, nasopharynx, teeth, scalp, skin and glands were considered, also the nervous condition and general well or ill being. So far as time permitted, diet and habits were discussed and suitable advice given. A record was kept of all examinations, and copies of a summary were sent to the superintendent, teacher or some one else sufficiently interested to volunteer to follow up the cases needing oversight. In almost all of the small towns visited there was no school nurse or visiting nurse of any kind.

During the summer twenty-eight clinics were held and nearly 1,600 children examined. From a study of the records of the first 200 school children examined, between the ages of five and fifteen years, living on farms in an unusually healthful section of the Berkshires, the following facts appear: Eighty-five per cent of these children have decaying teeth. Only 10 per cent have had any dental care whatsoever. Sixteen and five-tenths per cent have pathologically enlarged tonsils. Fourteen and five-tenths per cent have adenoids so hypertrophied as to interfere seriously with respiration. Fourteen and five-tenths per cent have vision so defective as to be evident without special tests. Two and five-tenths per cent have scoliosis; 2 per cent, kyphosis; 5 per cent, enlarged thyroids; 2.5 per cent, heart symptoms; 1.5 per cent, chronic otitis media. A notable fact, and one which reflects upon the administration of health laws as regards school children, is that 50.5 per cent of these school children have not been successfully vaccinated.

Cancer Control.

Our activities in the direction of cancer control have followed the lines laid down last year. We have continued our relationship with the Cancer Commission of Harvard University, which has enabled us

to offer free diagnosis to all physicians of the State for pathological specimens suspected of being cancerous. A special booklet on the subject of cancer was sent out to physicians in the State.

Educational Work.

Our educational work carried on through health weeks, moving pictures, lectures, including those with the stereopticon view, pamphlets and demonstrations on the care of the baby have been continued this year as in previous years. An exhibit on mouth hygiene has been added and is proving of great value, also one on the school lunch.

As many as possible of the agricultural fairs were reached again this year. Noteworthy among these was the Eastern States Exposition at Springfield, where we had the use of a small, well-arranged, separate building, through the courtesy of Mrs. Storrow. At most of the fairs we had, in addition to the demonstrations by the nurse in charge of our exhibit, additional demonstrations by a dental hygienist and a nutritionist. In a number of instances the home demonstration agents of the Massachusetts Agricultural College joined with us for this purpose. Our pediatrician also weighed and measured children at many of the fairs and advised with such parents as were interested in improving the health of their children.

The Division has issued a number of new or revised pamphlets this year, including "The School Lunch," "Fly Danger," "Cancer Facts Every Adult Should Know," "Suggested List of Books on Hygiene for the Town Library," "Instructions for Home Care of the Mouth," "How Cooking affects the Digestibility of Foods," "Do You Know That" (a pamphlet on mouth hygiene), "The Baby and You" (revised edition), "Carbohydrate Foods" (revised edition), "The Control of Ophthalmia Neonatorum," "School Health Program," "Illustrated Lectures and Moving Pictures."

We have purchased for use throughout the State two moving-picture films entitled "An Equal Chance" and "Mouth Hygiene." The former film has to do with the importance of the public health nurse; the title of the latter explains its subject-matter.

Our prenatal and postnatal letter service has been continued during the year. New requests for prenatal letters have been received to the number of over 2,000; requests for postnatal letters, exclusive of those being carried along from our prenatal letter file, number about 500.

Two interesting developments of our lecture service during the past year deserve to be recorded. The first was the giving of a series of

three talks before the students of the normal schools of the State on public health subjects. These lectures were arranged through the courtesy of the State Department of Education. It is planned to repeat this course during the coming year. The second was a series of talks to nurses in training given largely through the District Health Officers and their nursing assistants, but participated in by the Division of Hygiene, by the presentation of the subjects of child hygiene in general and school nursing in particular. This course, also, is to be repeated during the coming year.

Statistical tables relative to health weeks, exhibits and lectures follow: —

Exhibits were given at the following places for health weeks or health days from Dec. 1, 1919, to Nov. 30, 1920: —

Barre[1] (twice).	Lowell.
Bolton.	Ludlow.
Boston[1] (five times).	North Adams.
Clinton.	North Brookfield.
Hardwick[1] (twice).	Quincy.
Harvard.	Somerville.
Hingham.	Uxbridge.
Lancaster.	Winchendon.
Lee.	Worcester.
Leicester.	

Exhibits were given at the following agricultural fairs: —

Athol.	Walpole.
Nantucket.	Ware.
Springfield.	Westport.

Lectures were given on the following subjects during the year: —

Mouth Hygiene,	267	Legislation,	19
Public Health,	102	Preventable Diseases,	17
Venereal Diseases and Social Hygiene,	95	Sanitation,	14
Foods,	69	Work of State Department of Public Health,	4
Child Welfare,	53	Rural Sanitation,	1
School Hygiene,	39	Wear and Tear Diseases of Adult Life,	1
Communicable Diseases,	37		
Public Health Nursing,	32	Total,	794
Personal Hygiene,	24		
Tuberculosis,	20		

[1] Different sections of the town.

Lectures were given during the year, by months, with the approximate number of people reached, as follows: —

Month.	Lectures.	Number present.
1919.		
December,	62	11,997
1920.		
January,	50	9,580
February,	26	2,886
March,	68	6,867
April,	168	20,342
May,	177	18,444
June,	80	8,467
July,	24	1,278
August,	7	265
September,	13	1,627
October,	56	4,518
November,	63	9,039
Totals,	794	95,310

During the fiscal year ending Nov. 30, 1920, lectures were given in the following cities and towns: —

Abington,	1	Brookline,	2
Acton,	3	Burlington,	1
Acushnet,	1	Cambridge,	6
Agawam,	2	Canton,	1
Amherst,	4	Chatham,	2
Andover,	4	Chelsea,	5
Arlington,	5	Chesterfield,	3
Ashby,	2	Clinton,	10
Attleboro,	1	Concord,	1
Barnstable,	11	Conway,	1
Barre,	8	Cummington,	1
Becket,	1	Danvers,	1
Bedford,	2	Dedham,	1
Belchertown,	5	Deerfield,	6
Billerica,	3	Dighton,	2
Bolton,	2	Easthampton,	1
Boston,	132	Easton,	6
Boxford,	1	Everett,	2
Braintree,	3	Fall River,	3
Brewster,	1	Falmouth,	1
Bridgewater,	7	Fitchburg,	9

Foxborough,	2	Northborough,	9
Framingham,	4	North Brookfield,	5
Gardner,	3	Norton,	1
Gloucester,	1	Norwell,	1
Goshen,	1	Norwood,	1
Grafton,	3	Orleans,	1
Granby,	1	Oxford,	10
Greenfield,	7	Petersham,	4
Groton,	1	Pittsfield,	9
Groveland,	1	Princeton,	7
Hadley,	9	Quincy,	17
Hanover,	9	Randolph,	1
Hanson,	1	Reading,	3
Hardwick,	8	Revere,	1
Harvard,	3	Richmond,	2
Harwich,	3	Rockport,	1
Haverhill,	16	Rutland,	1
Hingham,	14	Salem,	10
Holden,	4	Sandwich,	2
Holyoke,	4	Saugus,	1
Hopedale,	1	Scituate,	4
Huntington,	6	Shelburne,	1
Lancaster,	1	Shirley,	1
Lawrence,	5	Shrewsbury,	1
Lee,	1	Somerville,	2
Leicester,	5	Southampton,	8
Lenox,	1	Southbridge,	1
Leominster,	5	Spencer,	2
Lexington,	8	Springfield,	10
Lowell,	55	Sterling,	1
Ludlow,	1	Stoneham,	1
Lynn,	16	Sunderland,	1
Malden,	5	Sutton,	1
Marblehead,	2	Swampscott,	3
Mattapoisett,	3	Topsfield,	1
Medford,	1	Townsend,	3
Melrose,	1	Uxbridge,	5
Middleborough,	6	Wakefield,	1
Milford,	1	Walpole,	1
Millbury,	1	Waltham,	1
Milton,	1	Ware,	6
Natick,	1	Wareham,	1
Needham,	1	Watertown,	2
Newburyport,	4	Webster,	1
Newton,	13	Wellfleet,	1
North Adams,	9	Westborough,	1
Northampton,	9	West Boylston,	5

Westfield,	4	Williamsburg,	2
Westhampton,	3	Winchendon,	7
Westport,	3	Winchester,	8
West Springfield,	1	Winthrop,	2
Weymouth,	1	Woburn,	1
Whitman,	2	Worcester,	84

This makes a total of 148 cities and towns in Massachusetts where lectures were given by Department lecturers.

Special Work.

Reference was made in the last annual report of this Division to the situation in Massachusetts as regards maternal and infant mortality. It was pointed out that the trend of the total mortality of infants under one year of age in this State is downward, with occasional rises like that of 1918. The total rate for 1919 was lower than we have yet had in this State. It was further pointed out, however, that the infant mortality during the first four weeks of life is not diminishing and that the mortality among women fifteen to forty-five years of age from causes due directly to childbirth is increasing in this State.

Certain bills introduced into last year's Legislature looked towards financing an effort to reduce this mortality amongst mothers and babies. No bill was passed during 1920 but a resolve which created a special commission to study the whole question of the protection of mothers and infants was passed instead. The Director of the Division of Hygiene served as director of investigations at the request of the special commission. The results of the study of the commission are available in the report to the special session of the Legislature held in December, 1920. It is fitting, however, to point out here a few of the facts brought out by the investigation because of their far-reaching bearing upon infant and maternal mortality in Massachusetts.

It has been generally considered that poverty is one of the great underlying causes of infant mortality. Studies by the Children's Bureau have shown that in the areas studied the infant mortality increased as the income of the fathers decreased. It has been generally assumed that this would be true of the maternal mortality and of the infant mortality during the first two or three weeks. The results of the Massachusetts investigation show that this is not so. More than half the mothers who died came from families where the total income was undoubtedly sufficient to pay for medical care. It was shown that none of the mothers who died had had what might reasonably be

called adequate prenatal care. Furthermore, it was demonstrated in a study of a thousand cases that 50 per cent of the infants who died had one visit or none at all from a physician before death. Another interesting fact brought out was that most of the homes where mothers died showed, in the opinion of competent observers, fair or good housing conditions.

The logical conclusion to be drawn from the facts stated above seems to be that mothers and infants die in Massachusetts largely because of neglect of hygiene. This conclusion justifies us in continuing the plan we have always followed of directing our efforts towards the education of our citizens in matters of personal hygiene. It further confirms us in our belief that this can be most effectually done through the extension of public health nursing service in the homes of the citizens of the Commonwealth.

Division of Tuberculosis (Sanatoria)

William J. Gallivan, M.D., *Director*

Report of Division of Tuberculosis (Sanatoria).

The Division of Tuberculosis was established Dec. 1, 1920, pursuant to chapter 350 of the General Acts of 1919. By the provisions of this act the Board of Trustees of Hospitals for Consumptives was abolished and all the rights, powers, duties and obligations of said Board were transferred to the Department of Public Health. The Commissioner of Public Health was further directed by said act to establish a division within said Department to supervise the administration of the sanatoria.

Previous to the passage of this act the tuberculosis work of the Department of Public Health was confined to the Division of Communicable Diseases. An important step taken by this Division was the compilation of all known cases of tuberculosis in Massachusetts from Jan. 1, 1915, to Jan. 1, 1920. This work has been transferred to the Division of Tuberculosis. The Division of Tuberculosis therefore has the administrative supervision of the four State sanatoria, the supervision of all known cases of tuberculosis in the State, and the general supervision of all tuberculosis activity in the Commonwealth.

We are fond of referring to the fact that Massachusetts was the first State in the Union to erect and maintain a hospital for consumptives. Always a pioneer in all that pertains to the benefit of humanity this grand old Commonwealth blazed the trail in the effort to stamp out the great white plague, and in 1898 opened the doors of the first State sanatorium for consumptives in America at Rutland, Mass. The wheels of legislation necessary for this glorious achievement were started on Jan. 30, 1895, by the introduction of the following bill: —

An Act to establish the Massachusetts Hospital for Consumptives and Tubercular Patients.

Be it enacted, etc., as follows:

Section 1. The governor, with the advice and consent of the council, shall appoint five persons who shall constitute the board of trustees of the Massachusetts hospital for consumptives and tubercular patients, and who shall hold office for terms of one, two, three, four and five years respectively, beginning with the first Monday of July in the present year, and until their respective successors are appointed and qualified; and previous to the first Monday in July in each year hereafter, the governor shall in like manner appoint one such trustee to hold office for the term of five years, beginning with the first Monday in July of the

year of his appointment, and until his successor is appointed and qualified. Any such trustee may be removed by the governor with the advice and consent of the council for such cause as they may deem sufficient and as shall be assigned in the order for removal. Any vacancy occurring in said board shall be filled in like manner for the unexpired term.

Section 2. The lands held by said trustees in trust for the Commonwealth for the use of said hospital, as hereinafter provided, shall not be taken for a street, highway or railroad without leave of the legislature specially obtained.

Section 3. Said trustees shall be a corporation for the same purposes for which the trustees of each of the state lunatic hospitals are made a corporation under section five of chapter eighty-seven of the Public Statutes, with all the powers necessary to carry said purposes into effect.

Section 4. Said trustees shall have authority to purchase in behalf of the Commonwealth suitable real estate as a site for said hospital, and to cause to be erected thereon suitable buildings for said hospital which shall furnish suitable accommodations for not less than two hundred patients and for the officers, employees and attendants, and to provide for the equipment and furnishing of said buildings: *Provided, howeve* ', that the expenditure for carrying out the purpose of this act shall not exceed one hundred and fifty thousand dollars. No expenditure shall be made for the erection of buildings except for plans therefor, until said plans have been approved by the governor and council, and no such approval shall be given unless the governor and council shall be satisfied that the cost of the real estate and the erection and completion of buildings and the equipment and furnishing of the same ready for occupancy will not exceed one hundred and fifty thousand dollars. Said trustees shall have authority to make all contracts and employ all agents necessary to carry into effect the provisions of this act.

Section 5. Said trustees shall have the same powers vested in them and shall be required to perform the same duties for the management and control of said hospital as are vested in and required of the trustees of the Massachusetts hospital for dipsomaniacs and inebriates.

Section 6. When the buildings constructed under the provisions of this act are so far completed that in the opinion of said trustees they may be properly used for the purposes of said hospital said trustees shall notify the governor, who shall thereupon issue his proclamation establishing said hospital.

Section 7. After the establishment of said hospital said trustees shall receive no compensation for their services, but they shall be reimbursed from the treasury of the Commonwealth for all expenses actually incurred by them in the performance of their official duties. The governor and council shall fix the compensation to be made to them for services rendered in the selection and purchase of real estate and the construction, equipment and furnishing of the hospital buildings.

Section 8. Said trustees may appoint all necessary physicians, assistants and employees necessary for the proper administration of the affairs of said hospital and may incur all expenses necessary to the maintenance of the same; but the annual expense incurred under this section shall not exceed
thousand dollars.

Section 9. Such inmates of said hospital able to pay for their board shall be charged for the same. The board of such inmates as have a legal settlement in some city or town shall be paid by said city or town if such patients are received at said hospital on the request of the overseers of the poor of said city or town. The trustees may in their discretion receive other patients who have no means to pay for treatment; and the board of all such patients shall be paid from the treasury of the Commonwealth.

Section 10. There shall be thorough visitations of said hospital by two of the trustees thereof monthly, and by a majority of them quarterly, and by the whole board semi-annually, at each of which a written account of the state of the institution shall be drawn up, which shall be presented at the annual meeting to be held between the first days of the months of October and November. At the annual meeting the trustees shall make a detailed report in the same manner as is required of the trustees of the state lunatic hospitals, and shall audit the report of the treasurer, which shall be presented at said annual meeting, and transmit it with their annual report to the governor and council.

Section 11. The accounts and books of the treasurer shall at all times be open to the inspection of the trustees.

Section 12. This act shall take effect upon its passage.

Many hearings were held on this measure; violent opposition as well as enthusiastic support was in evidence, but in June, 1895, the bill was passed and became a law. The three subsequent years were spent by the trustees in investigation, study and construction. The various problems of climate and altitude were carefully considered, and after a most thorough and painstaking study the town of Rutland was chosen as the best location for the sanatorium.

The original capacity of the sanatorium was 150 beds. From time to time additional wards were added. Admission to the sanatorium was obtained only upon the certificate of experts appointed to make physical examinations and to certify for admission only cases which were favorable for arrest. In spite of such precaution the 350 beds in the sanatorium were constantly filled and a long waiting list of applicants for admission drew attention to the tuberculosis situation in Massachusetts.

In 1907 an appropriation was made for the construction of three additional sanatoria. The work of constructing these institutions was entrusted to a newly organized Board of Trustees of Hospitals for Consumptives, and upon their completion the Board of Trustees of the Rutland State Sanatorium was abolished.

The additional sanatoria were located at North Reading, Lakeville and Westfield, and opened their doors for the admission of patients in 1909 and 1910, respectively. The completion of these sanatoria made available 450 additional beds for consumptives. From time to time additions were made to these institutions so that to-day there

are available for consumptives in the four State sanatoria 1,100 beds, as follows: Rutland, 350 beds; Lakeville, 275; Westfield, 275; North Reading, 200.

Under the policy of the new Board of Trustees these sanatoria were rapidly filled and a waiting list was easily established. The custom of admitting to the Rutland Sanatorium only incipient cases was continued. Residence at Rutland was limited to two years and all patients were admitted on a thirty days' trial. Cases which appeared unfavorable for arrest and cases which had completed their time limit were transferred from Rutland to the other sanatoria.

Admission to the State sanatoria was open to persons, male and female, over fifteen years of age, except at Westfield where 165 beds were reserved for children between the ages of five and fifteen years. At Westfield a school with a modern curriculum was maintained so that children undergoing treatment might have educational opportunities.

At this time of our world's history let it be remembered that general hospitals had closed their doors to persons ill with pulmonary tuberculosis. Outside of the few private hospitals which harbored consumptives there was no "Inn at Bethlehem" for persons suffering from this disease. The medical profession could only recommend a change of climate, a form of treatment practiced by Hippocrates who lived in 400 B.C. Such treatment could be had only by the well-to-do. The poor consumptive had no alternative but to remain at home infecting unwittingly those who were near and dear to him. And so the wisdom of the policy of the trustees of admitting to the new sanatoria advanced cases of consumption is apparent.

Such is the charge committed to our care: a group of sanatoria successfully administered for twenty-six years by unpaid Boards of Trustees, such as Massachusetts can always summon to her aid for advice and achievement.

Additional milestones in the progress of tuberculosis work in Massachusetts are: first, the act of the State Department of Health declaring tuberculosis a disease dangerous to the public health; second, the dispensary act, requiring every city and every town containing a population of 10,000 or more to maintain a dispensary for the diagnosis and treatment of needy patients afflicted with tuberculosis; third, the county hospital act.

The early colonists who settled in Massachusetts recognized the danger to the community of communicable disease. One of the earliest acts on the statute books in Massachusetts is chapter 75 of the Revised Laws, requiring cities to make hospital provision for cases of

sickness declared by the State Department of Health to be dangerous to the public health. In 1907, when tuberculosis was added to the list of such diseases, automatically it became necessary for cities to make provision for the hospital care of consumptives. This law was pretty generally violated in regard to care of tuberculosis patients. In 1916 the county hospital act was passed, which provided that cities of 50,000 or more in population must maintain hospitals for tuberculous patients and that cities of less than 50,000 shall contract and support a county hospital. All the counties of the State have complied with this law except Worcester and Middlesex counties, and the district of Chelsea, Revere and Winthrop, the latter having been allowed to combine in meeting the requirements of the county act. Extension of time has been granted these counties for the fulfillment of their obligations on account of the abnormal conditions prevailing at the present time regarding the high cost of building material and labor. Five county hospitals are completed and functioning. The Essex County Tuberculosis Hospital is nearing completion and will admit patients at an early date. The total bed capacity of these county hospitals is as follows: Bristol County at Attleboro, 60 beds; Barnstable County at Bourne, 26 beds; Norfolk County at Braintree, 71 beds; Plymouth County at South Hanson, 66 beds; Hampshire County at Northampton, 50 beds; Essex County at Middleton, 112 beds.

As a further result of this act there are in operation 14 municipal tuberculosis hospitals in the State, with a total bed capacity of 1,127 beds; 8 private incorporated tuberculosis hospitals, with a total bed capacity of 179 beds.

The dispensary act, passed in 1911, provided that every city and town of 10,000 population or over shall maintain dispensaries for the diagnosis of tuberculosis. As a result of this act there are 54 dispensaries functioning under the supervision of the State Department of Public Health.

Such is the machinery which Massachusetts has provided for the conquest of consumption.

The present time seems opportune to revise the policy governing the State sanatoria. With the excellent equipment which the State has provided in its chain of county and municipal tuberculosis hospitals, the time seems ripe to place the four State sanatoria on an even footing and to admit to these institutions only cases favorable for arrest.

The continued residence of patients in the sanatoria extending over a period of five to ten years will simply convert the sanatoria into homes for consumptives and will defeat the very object for which

sanatoria strive. Sanatorium treatment aims to arrest the disease and to turn the patients back to society capable of self-support. The heartiest co-operation on the part of the patient is essential for this achievement. It is estimated that intensive sanatorium treatment of one or two years' duration should accomplish this object, and failure to record such results is believed to be due to lack of co-operation or to the unsuitability of the case for sanatorium treatment. Before such a policy can be put into effect much preliminary work is needed. Some of these preliminary steps have been taken and will be described under separate headings.

Consultation Clinics.

Medical literature teems with criticism of the general practitioner for failure to recognize the early signs and symptoms of pulmonary tuberculosis. Trite as this subject is, cases of pulmonary tuberculosis in a hopeless condition are still being referred to the sanatoria by general practitioners. In one instance a patient so referred died at the doors of the sanatorium. In another instance a case classified as pretuberculous was placed on the dangerous list immediately upon admission and died in a few weeks. To meet this condition a series of consultation clinics has been inaugurated where general practitioners may secure, without charge, the diagnosis of an expert. These clinics consist of a high-grade consultation service. Patients examined at these clinics must be accompanied or referred by their family physician, to whom a written report is made. The following table shows the location of these clinics: —

City or Town.	Location.	Time.	Consultants.
Worcester,	Municipal Tuberculosis Dispensary, Belmont Hospital.	1st Wednesday of each month, 2 to 5 P.M.	Medical staff of the Rutland State Sanatorium.
Gardner,	Municipal Tuberculosis Dispensary, Municipal Building, 83 Pleasant Street.	2d Wednesday of each month, 2 to 5 P.M.	Medical staff of the Rutland State Sanatorium.
Fitchburg,	Municipal Tuberculosis Dispensary, 366 Main Street.	3d Wednesday of each month, 2 to 5 P.M.	Medical staff of the Rutland State Sanatorium.
Clinton,	Municipal Tuberculosis Dispensary, Municipal Building.	4th Wednesday of each month, 2 to 5 P.M.	Medical staff of the Rutland State Sanatorium.
Lowell,	Municipal Tuberculosis Dispensary, City Hall.	1st Wednesday of each month, 2 to 5 P.M.	Medical staff of the North Reading State Sanatorium.
Lawrence,	Municipal Tuberculosis Dispensary, 37 Jackson Street.	2d Wednesday of each month, 2 to 5 P.M.	Medical staff of the North Reading State Sanatorium.
Haverhill,	Municipal Tuberculosis Dispensary, City Hall.	3d Wednesday of each month, 2 to 5 P.M.	Medical staff of the North Reading State Sanatorium.
Woburn,	Municipal Tuberculosis Dispensary, Board of Health Rooms.	4th Wednesday of each month, 2 to 5 P.M.	Medical staff of the North Reading State Sanatorium.

City or Town.	Location.	Time.	Consultants.
Taunton,	Municipal Tuberculosis Dispensary, City Hall.	1st Wednesday of each month, 2 to 5 P.M.	Medical staff of the Lakeville State Sanatorium.
Brockton,	Municipal Tuberculosis Dispensary, Board of Health Office, City Hall.	2d Wednesday of each month, 2 to 5 P.M.	Medical staff of the Lakeville State Sanatorium.
Fall River,	Municipal Tuberculosis Dispensary, Purchase Street.	3d Wednesday of each month, 2 to 5 P.M.	Medical staff of the Lakeville State Sanatorium.
Plymouth,	Municipal Tuberculosis Dispensary, Room G, Governor Bradford Building, Town Square.	4th Wednesday of each month, 2 to 5 P.M.	Medical staff of the Lakeville State Sanatorium.
Pittsfield,	Municipal Tuberculosis Dispensary, House of Mercy Hospital.	1st Wednesday of each month, 2 to 5 P.M.	Medical staff of the Westfield State Sanatorium.
Springfield,	Municipal Tuberculosis Dispensary, 137½ State Street.	2d Wednesday of each month, 2 to 5 P.M.	Medical staff of the Westfield State Sanatorium.
Holyoke,	Municipal Tuberculosis Dispensary, City Hall Annex, Room 412.	3d Wednesday of each month, 2 to 5 P.M.	Medical staff of the Westfield State Sanatorium.
Adams,	Municipal Tuberculosis Dispensary, Greylock Bank Building.	4th Wednesday of each month, 2 to 5 P.M.	Medical staff of the Westfield State Sanatorium.

Facilities for consultation are provided at each State sanatorium for every day of the week (Saturdays, Sundays and holidays excepted) between the hours of 2 and 5 o'clock.

Attendance at these clinics is not restricted to the inhabitants of the cities named. Physicians are invited to make use of any clinic, it being inferred that they will select the one nearest their home city or town.

The Department of Public Health earnestly pleads for the co-operation of the family physician in this consultation service.

Further extension of this service will require additions to the sanatoria staff and plans are already in preparation for this step, which will increase the number of men properly trained for this work.

Examination Clinics.

No report of the progress in tuberculosis work in this State would be complete without recording the untiring efforts of the Massachusetts Anti-Tuberculosis League in securing expert examination of contacts. In cities and towns of 10,000 population and over, such service is rendered by tuberculosis dispensaries, as provided by chapter 576, Acts of 1911. In smaller towns where no such provision is made, the League has vigorously prosecuted its work and has appealed to the sanatoria for assistance. Willing co-operation has been granted by the creation of a series of examination clinics. Upon due notice from the League, the sanatoria staff will examine all cases provided by the League. This service provides expert diagnosis for cases of contacts and suspects which the case finding activity of the Massachusetts Tuberculosis League provides.

Observation Hospital.

Everybody agrees that the diagnosis of early pulmonary tuberculosis is oftentimes a very difficult matter. In many cases it requires expert observation extending over a period of weeks. Under our existing statutes only cases definitely classified as tuberculous can be admitted to the State sanatoria. An observation hospital, conducted on the same plan as the Psychopathic Hospital follows in its intensive study of mental diseases, seems desirable. From this hospital cases properly classified could be referred to the various sanatoria and tuberculosis hospitals.

Subsidy.

Cities and towns which under certain conditions provide hospital care for bacillary cases of pulmonary tuberculosis are reimbursed by the State at the rate of $5 per week for each person. Further legislation extended the granting of this subsidy for hospital care of non-bacillary cases. For the year ending Nov. 30, 1920, this Division has received 2,481 claims for subsidy. Of this number, 1,662 claims, amounting to $135,720.05, were approved.

Examination of Prisoners.

At the request of Mr. Sanford Bates, Commissioner of the Department of Correction, a physical examination, with particular reference to the diagnosis of pulmonary tuberculosis, was made of the inmates of jails, prisons and houses of correction in the State. This examination was made by the staffs of the various State sanatoria, with the following results: —

Number of prisoners examined,	1,500
Active pulmonary tuberculosis,	7
Further observation,	43

Public Health Nurses.

Local boards of health are entrusted with the supervision of diseases declared dangerous to the public health which occur within their territory. For this purpose public health nurses are employed. In order to stimulate interest in the supervision of cases of pulmonary tuberculosis the Division has organized the public health nurses of all the cities and towns in the State into groups based upon the territorial assignments of the District Health Officers. It is planned to have these nurses meet at the various sanatoria, where tuberculosis problems will be discussed and sanatorium conditions observed.

Consultants.

The need of consultants in diseases other than tuberculosis in the State sanatoria is becoming more pressing. Patients in these institutions often develop intercurrent complications which retard their improvement. Particularly is this true in cases of diseases of the nose, throat, eye and ear. Defective teeth are a frequent source of complaint. Surgical conditions frequently arise and mental cases are not infrequent. To meet these conditions it is planned to place at an early date in each sanatorium a full-time dental hygienist supplemented by a part-time dentist. Part-time consultants in the various diseases mentioned must soon be furnished to insure the full measure of care which Massachusetts provides for her afflicted ones.

Follow-up Work.

There is on file in this Division a list of all known cases of tuberculosis reported within the past five years. This list numbers about 20,000 cases. Supervision of these cases comes within the duties of local boards of health. In every case an original history card is required, as follows: —

DEPARTMENT OF PUBLIC HEALTH

Tuberculosis

(City or Town) Date

Form of disease S. M. W. Sex

Name of patient, Pos. sputum date, Age
(Surname first) Neg. sputum date, Color

Residence, Birthplace,

Last previous address, Nationality,

In U. S.,

Where is the patient at this date, In this place,

Reported (to local Board of Health) (to Dept. of Public Health)

(Section 52, Revised Laws, 75)

Institutional History

Date of application	Sanatorium or hospital	Date of admission	Condition on admission	Date of discharge	Condition on discharge	Sputum

Occupation now, Full or part time

Occupation when illness began, Does working make patient worse,

Present medical supervision (name of physician, or dispensary, if any),

Illness began, Present condition,

If not working, how does patient spend time,

Personal hygiene (including care of sputum),

Home sanitation, Occupation sanitation,

Anything to suggest cause of disease or source of infection,

What immediate help, if any, should patient have,

Condition of other members of household,
(If tuberculous, give names)

Remarks (including briefly, family and personal history — with names and dates of respiratory diseases, if any),

Husband's full name.

.....
(Signature of tuberculosis worker or investigator)

If minor, father's full name.

Follow-up work is continued by this Division. Every six months a report of these cases is required, as follows: —

DEPARTMENT OF PUBLIC HEALTH

Division of Tuberculosis

Follow-up Card

Town.....

Name Address

Date.	Supervision.	Work.	Sputum.	Remarks (including any special feature of case).

NORTH READING STATE SANATORIUM.

Resident Officers.

Carl C. MacCorison, M.D.,	*Superintendent.*
Earle C. Willoughby, M.D.,	*Assistant Superintendent and Physician.*
Joseph W. Reddy, M.D.,	*Assistant Physician.*
Kathryn V. Daily,	*Superintendent of Nurses.*
Mira B. Ross,	*Matron.*
J. Ellis Doucette,	*Steward.*
Daniel J. Scott,	*Chief Engineer.*
Edward Leary,	*Head Farmer.*

REPORT OF THE SUPERINTENDENT.

To the Director of the Division of Tuberculosis, Department of Public Health, Room 365, State House, Boston, Mass.

I have the honor of presenting to you the report of the North Reading State Sanatorium for the year ending Nov. 30, 1920.

The records show that during the year 471 patients have been treated, and 279 have been admitted. There were 68,919 days of treatment in the year as against 63,103 days of treatment for the preceding year. The lowest daily census was 172 and the highest 203. The daily average number of patients was 188.30, which is 5½ per cent more than that of the preceding year.

There have been admitted during the year 3, or 1.09 per cent, incipient; 143, or 51.25 per cent, moderately advanced; 127, or 45.48 per cent, advanced; 2, or .71 per cent, nontuberculous; 3, or 1.09 per cent, not determined.

There has been a daily average of 68 bed cases, — approximately 36 per cent of the daily population.

Of the patients discharged, the average duration of residence in the sanatorium was 209 days, as opposed to 315 days for the preceding year; the longest residence of any one person was 1,948 days, and the shortest, 1 day.

Of the 279 cases admitted, 231, or 82.79 per cent, were inside workers. Two hundred and six cases were admitted from cities and towns having a population of 25,000 or more, as follows: Boston, 95; Cambridge, 3; Chelsea, 6; Everett, 13; Fall River, 2; Haverhill, 2; Lawrence, 10; Lynn, 12; Lowell, 16; Malden, 16; Medford, 3; Newton, 5; Revere, 3; Salem, 4; Somerville, 16.

One hundred and nine cases have been supported from private funds; 224 by cities and towns; 100 entirely by the State; 11 by the Bureau of War Risk Insurance; and 13 private cases have either become State or town charges. There were remaining on November 30, 18 private cases, 24 city or town cases, 35 State cases, 37 unknown cases, and 2 Bureau of War Risk Insurance cases, making a total of 186.

Of the patients discharged during the year, 93 males and 68 females had gained in weight, the total gain being 1,848 pounds. The average male gain was 11.38 pounds, and the average female gain was 11.6 pounds; 4 patients remained stationary; 56 had lost; 47 had died; and 17 were not considered.

Three patients, or 1.05 per cent, have been discharged arrested; 14, or 4.91 per cent, apparently arrested; 32, or 11.22 per cent, quiescent; 100, or 35.08 per cent, improved; 55, or 19.29 per cent, unimproved; 47, or 16.49 per cent, have died; 11.93 per cent were not considered (duration of stay being less than one month); and 2, or .70 per cent, nontuberculous. The decrease in the number of deaths over that of preceding years is due to the fact that many very ill patients were discharged, their relatives preferring to have them pass away at home.

The average age was 31.43 years. One hundred and twenty-eight patients were foreign born, and 89 were American born but of foreign parentage. Twenty-four patients admitted have been previously treated at this sanatorium.

The total cost of maintenance for the year ending Nov. 30, 1920, was $159,531.40; deducting $1,008.72 from miscellaneous sources leaves a net amount expended for maintenance of $158,522.68. The net per capita cost per week was $16.1896. There has been collected from private patients $8,220.25, and from cities and towns $21,102.05. Further details will be found in succeeding pages of this report.

Medical Report.

Our problem relative to the care of bed cases is becoming more difficult. The increase in admissions of advanced and moderately advanced cases needing bed treatment has demonstrated more forcibly than ever the necessity of providing additional wards for this type of case. Our inability to care for bed cases on open pavilions accounts for the low census of the past year.

Although an appropriation was granted for the employment of a full-time dentist, we were unable to find a competent man who was willing to accept the position.

Clinics.

In addition to the consultation clinics held at Lowell, Lawrence, Haverhill and Woburn, many patients have come directly to the sanatorium for examination and advice. Quite frequently we have been handicapped in arriving at a positive diagnosis in obscure cases, and we feel that an X-ray machine would be of material assistance to us in overcoming this difficulty.

Recommendations.

Our present equipment for fire protection is practically worthless. The buildings east of the power plant are entirely unprotected, owing to lack of sufficient water pressure. Should a fire occur in the institution, we would have to depend principally upon hand fire extinguishers and the water in our 25,000-gallon tank, with a maximum pressure of about 60 pounds. Our water supply has given us a great deal of trouble in the power plant, owing to excessive scaling of the boilers. I would recommend that the sum of $24,470 be appropriated for the installation of a fire protective system, as per plans and specifications submitted in 1917.

An X-ray outfit would be of great assistance to us in the examination of patients, and I would recommend that the sum of $5,370.22 be appropriated for the purchase of an outfit.

We have had frequent vacancies from time to time in our engineering department the past year. So many, in fact, that it has been absolutely impossible for us to make the necessary repairs in the engine room and about the institution. I would recommend that we employ an additional mechanic for a period of three months, or until such time as we can catch up on the necessary repairs.

Improvements.

The new chapel and nurses' dormitory was completed in June. Additional henhouses have been built, and about 1 acre of sprout land cleared for cultivation. Work was started on the cottage for the chief engineer and steward in September. In all probability this cottage will be ready for occupancy about the middle of February.

Medical Staff.

Dr. C. P. Harkins resigned on June 29, 1920, from the staff, and Dr. Joseph W. Reddy was appointed to fill the vacancy.

Acknowledgments.

The patients and employees appreciate the faithful services of the Catholic, Protestant, and Jewish chaplains, who in addition to their regular services have brought comfort and cheer by their frequent visits.

We wish especially to thank the First National Exhibitors for their many favors.

We acknowledge with grateful thanks the gifts, from various individuals and churches, of magazines, books, a Bible, various woolen and knit articles, and the candy, fruit and flowers sent in at Christmas time.

I wish to thank the heads of departments and the employees for their co-operation and assistance. I am deeply grateful to the Director of the Division of Tuberculosis for his support and advice during the year.

Very truly,

CARL C. MACCORISON,
Superintendent.

TREASURER'S REPORT.

To the Commissioner of Public Health.

I respectfully submit the following report of the finances of this institution for the fiscal year ending Nov. 30, 1920: —

CASH ACCOUNT.

Balance Dec. 1, 1919,				$1,801 04
Receipts.				
Institution Receipts.				
Board of inmates: —				
Private,		$8,220 25		
Cities and towns,		21,102 05		
			$29,322 30	
Sales: —				
Food,		$55 37		
Clothing and materials,		169 56		
Furnishings and household supplies,		40 85		
Medical and general care,		33 34		
Heat, light and power,		30 75		
Farm and stable: —				
Pigs and hogs,	$19 00			
Ice,	5 25			
Vegetables,	2 33			
Sundries,	416 99			
		443 57		
Grounds,		8 03		
Repairs, ordinary,		14 66		
			796 13	
Miscellaneous receipts: —				
Interest on bank balances,		$139 75		
Sundries,		72 84		
			212 59	
				30,331 02
Refund, account of previous year's business,				23 70
Receipts from Treasury of Commonwealth.				
Maintenance appropriations: —				
Balance of 1919,			$10,877 10	
Advance money (amount on hand November 30),			8,000 00	
Approved schedules of 1920,			134,635 96	
				153,513 06
Special appropriations,				40,533 34
Total,				$226,202 16

Payments.

To treasury of Commonwealth: —			
Institution receipts,		$30,331 02	
Refunds, account of maintenance,	$76 56		
Account of other,	23 70		
		100 26	
			$30,431 28
Maintenance appropriations: —			
Balance November schedule, 1919,		$12,678 14	
Eleven months' schedules, 1920,	$134,635 96		
Less returned,	76 56		
		134,559 40	
November advances,		6,710 64	
			153,948 18
Special appropriations: —			
Approved schedules,		$40,533 34	
November advances,		129 91	
			40,663 25
Balance Nov. 30, 1920: —			
In bank,		$679 93	
In office,		479 52	
			1,159 45
Total,			$226,202 16

MAINTENANCE.

Balance from previous year, brought forward,	$789 48
Appropriation, current year,	163,355 00
Total,	$164,144 48
Expenses (as analyzed below),	159,531 40
Balance reverting to treasury of Commonwealth,	$4,613 08

Analysis of Expenses.

Personal services: —		
Carl C. MacCorison, superintendent,	$3,600 00	
Medical,	3,504 57	
Administration,	5,132 04	
Kitchen and dining-room service,	7,940 17	
Domestic,	10,005 48	
Ward service (male),	2,977 40	
Ward service (female),	9,442 00	
Engineering department,	6,361 89	
Repairs,	3,306 94	
Farm,	3,547 36	
Stable, garage and grounds,	2,058 50	
		$57,876 35
Religious instruction: —		
Catholic,	$600 00	
Hebrew,	500 00	
Protestant,	500 00	
		1,600 00
Amount carried forward,		$59,476 35

Amount brought forward,		$59,476 35
Travel, transportation and office expenses: —		
Advertising,	$37 97	
Postage,	199 07	
Printing and binding,	487 18	
Stationery and office supplies,	557 12	
Telephone and telegraph,	334 59	
Travel,	408 38	
Freight,	11 75	
		2,036 06
Food: —		
Flour,	$2,213 35	
Cereals, rice, meal, etc.,	953 18	
Bread, crackers, etc.,	53 39	
Peas and beans (canned and dried),	424 62	
Macaroni and spaghetti,	68 20	
Potatoes,	1,242 85	
Meat,	14,626 72	
Fish (fresh, cured and canned),	1,729 73	
Butter,	5,126 43	
Butterine, etc.,	451 60	
Cheese,	144 65	
Coffee,	634 75	
Tea,	145 67	
Cocoa,	49 54	
Whole milk,	14,092 08	
Milk (condensed, evaporated, etc.),	127 31	
Eggs (fresh),	5,550 45	
Sugar (cane),	3,255 15	
Fruit (fresh),	452 01	
Fruit (dried and preserved),	1,356 18	
Lard and substitutes,	84 84	
Molasses and syrups,	101 66	
Vegetables (fresh),	348 56	
Vegetables (canned and dried),	1,559 80	
Seasonings and condiments,	578 14	
Yeast, baking powder, etc.,	358 00	
Sundry foods,	271 79	
Freight,	699 13	
		56,699 78
Clothing and materials: —		
Boots, shoes and rubbers,	$283 04	
Clothing (outer),	490 65	
Clothing (under),	109 05	
Hats and caps,	75	
Socks and smallwares,	48 26	
Freight,	4 88	
		936 63
Furnishings and household supplies: —		
Beds, bedding, etc.,	$2,142 17	
Carpets, rugs, etc.,	133 12	
Crockery, glassware, cutlery, etc.,	632 37	
Dry goods and smallwares,	112 38	
Electric lamps,	237 01	
Amounts carried forward,	$3,257 05	$119,148 82

Amounts brought forward,	$3,257 05	$119,148 82
Furnishings and household supplies — *Concluded.*		
Fire hose and extinguishers,	40 32	
Furniture, upholstery, etc.,	302 02	
Kitchen and household wares,	1,172 93	
Laundry supplies and materials,	458 45	
Lavatory supplies and disinfectants,	390 39	
Table linen, paper napkins, towels, etc.,	562 27	
Freight,	102 41	
		6,285 84
Medical and general care: —		
Books, periodicals, etc.,	$65 30	
Entertainments, games, etc.,	794 07	
Funeral expenses,	30 00	
Ice and refrigeration,	144 62	
Laboratory supplies and apparatus,	54 51	
Medicines (supplies and apparatus),	1,550 05	
Medical attendance (extra),	83 00	
Sputum cups, etc.,	346 14	
Tobacco, pipes, matches,	139 73	
Sundries,	8 00	
Freight,	92 84	
		3,308 26
Heat, light and power: —		
Coal (bituminous),	$5,515 85	
Freight and cartage,	4,905 73	
Coal (anthracite),	1,028 26	
Freight and cartage,	476 54	
Gas,	34 93	
Oil,	292 26	
Operating supplies for boilers and engines,	252 27	
Freight,	8 94	
		12,514 78
Farm: —		
Bedding materials,	$64 30	
Blacksmithing and supplies,	41 10	
Carriages, wagons and repairs,	32 03	
Dairy equipment and supplies,	279 87	
Fencing materials,	142 75	
Fertilizers,	794 02	
Grain, etc.,	3,223 93	
Hay,	209 11	
Harnesses and repairs,	1 25	
Other live stock,	293 00	
Labor (not on pay roll),	2,245 26	
Spraying materials,	47 52	
Stable and barn supplies,	24	
Tools, implements, machines, etc.,	381 81	
Trees, vines, seeds, etc.,	198 57	
Veterinary services, supplies, etc.,	135 60	
Sundries,	23 73	
Freight,	286 16	
		8,400 25
Amount carried forward,		$149,657 95

Amount brought forward,		$149,057 95
Garage, stable and grounds: —		
Automobile repairs and supplies,	$1,410 21	
Bedding and materials,	73 75	
Blacksmithing and supplies,	35 05	
Carriages, wagons and repairs,	25 88	
Grain,	241 75	
Hay,	23 68	
Harnesses and repairs,	13 95	
Rent,	425 00	
Road work and materials,	38 50	
Spraying materials,	5 20	
Tools, implements, machines, etc.,	407 10	
Trees, vines, seeds, etc.,	7 75	
Sundries,	1 25	
Freight,	15 68	
		2,724 75
Repairs, ordinary: —		
Cement, lime, crushed stone, etc.,	$74 29	
Electrical work and supplies,	257 57	
Hardware, iron, steel, etc.,	194 21	
Labor (not on pay roll),	35 00	
Lumber, etc. (including finished products),	460 70	
Paint, oil, glass, etc.,	497 72	
Plumbing and supplies,	392 78	
Steam fittings and supplies,	483 01	
Tents, awnings, etc.,	259 82	
Tools, machines, etc.,	218 94	
Boilers, repairs,	153 30	
Engines, repairs,	38 47	
Sundries,	254 09	
Freight,	93 08	
		3,412 98
Repairs and renewals: —		
Repairing piazza floors,	$172 40	
Shingling two pavilions,	337 49	
Drying tumbler,	893 31	
Henhouse,	1,102 12	
Repairing tank and tower,	126 00	
National marking machine,	383 99	
Collar and cuff press,	289 65	
Bed casters,	263 93	
Partitioning sleeping rooms,	166 83	
		3,735 72
Total expenses for maintenance,		$159,531 40

SPECIAL APPROPRIATIONS.

Balance Dec. 1, 1919,		$30,927 63
Appropriations for current year,		16,500 00
Total,		$47,427 63
Expended during the year (see statement below),	$40,533 34	
Reverting to treasury of Commonwealth,	5 58	
		40,538 92
Balance Nov. 30, 1920, carried to next year,		$6,888 71

Object.	Act or Resolve.	Whole Amount.	Expended during Fiscal Year.	Total Expended to Date.	Balance at End of Year.
Nurses' hall and chapel,	Chap. 211, 1919,	$48,150 00	$30,922 05	$48,144 42	$5 58*
Cottage for engineer and steward.	Chaps. 225, 629, 1920,	16,500 00	9,611 29	9,611 29	6,888 71
		$64,650 00	$40,533 34	$57,755 71	$6,894 29

* Balance reverting to treasury of the Commonwealth, . . $5 58
Balance carried to next year, ... 6,888 71
Total as above, ... $6,894 29

Resources and Liabilities.

Resources.

Cash on hand,		$1,159 45	
November cash vouchers (paid from advance money): —			
Account of maintenance,	$6,710 64		
Account of special appropriations,	129 91		
		6,840 55	
			$8,000 00
Due from treasury of Commonwealth from available appropriation, account of November, 1920, schedule,			16,972 00
			$24,972 00

Liabilities.

Schedule of November bills,	$24,972 00

Per Capita.

During the year the average number of inmates has been 188.30.
Total cost for maintenance, $159,531.40.
Equal to a weekly per capita cost of $16.2926.
Receipt from sales $796.13.
Equal to a weekly per capita of $0.0813.
All other institution receipts, $212.59.
Equal to a weekly per capita of $0.0217.

Respectfully submitted,
Carl C. MacCorison,
Treasurer.

Examined and found correct as compared with the records in the office of the Auditor of the Commonwealth.

Alonzo B. Cook,
Auditor.

VALUATION.

Real estate,	$217,242 50
Personal estate,	82,226 54
	$299,469 04

SPECIAL REPORT.

The following special report is prepared in accordance with a resolution of the National Conference of Charities and Corrections, adopted May 15, 1908: —

Population.

	Males.	Females.	Totals.
Number of inmates present at beginning of fiscal year,	112	80	192
Number received during the year,	141	138	279
Number discharged during the year,	149	136	285
Number at end of fiscal year,	104	82	186
Daily average attendance (*i.e.*, number of inmates actually present) during year.	106.75	81.55	188.30
Average number of officers and employees during the year,	43.58	30.78	74.36

Expenditures.

Current expenses: —		
1. Salaries and wages,	$57,876 35	
2. Clothing,	936 63	
3. Subsistence,	72,522 82	
4. Ordinary repairs and improvements,	3,412 98	
5. Office, domestic and outdoor expenses,	21,046 90	
Total,		$155,795 68
Extraordinary expenses,		3,735 72
Grand total,		$159,531 40

Summary of Current Expenses.

Total expenditure,	$159,531 40
Deducting extraordinary expenses,	3,735 72
	$155,795 68
Deducting amount of sales,	1,008 72
Total,	$154,786 96

Dividing this amount by the daily average number of patients — 188.30 — gives a cost for the year of $822.90, equivalent to an average weekly net cost of $15.82.

STATISTICAL TABLES.

TABLE 1. — *Admissions and Discharges.*

	Males.	Females.	Totals.
Patients in the sanatorium Dec. 1, 1919,	112	80	192
Number of patients admitted from Dec. 1, 1919, to Nov. 30, 1920, inclusive.	141	138	279
Number discharged from Dec. 1, 1919, to Nov. 30, 1920, inclusive.	149	136	285
Number of deaths (included in preceding item),	21	26	47
Number remaining in the sanatorium Nov. 30, 1920,	104	82	186
Daily average number of patients,	103.86	83.40	187.26

TABLE 2. — *Civil Condition of Patients admitted.*

	Males.	Females.	Totals.
Married,	73	65	138
Single,	59	65	124
Widowed,	8	8	16
Divorced,	1	–	1
Totals,	141	138	279

TABLE 3. — *Age of Patients admitted.*

	Males.	Females.	Totals.
14 to 20 years,	13	19	32
20 to 30 years,	46	63	109
30 to 40 years,	32	36	68
40 to 50 years,	40	17	57
Over 50 years,	10	3	13
Totals,	141	138	279

TABLE 4. — *Nativity and Parentage of Patients admitted.*

PLACES OF NATIVITY.	MALES.			FEMALES.			TOTALS.		
	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.
United States: —									
Massachusetts,	58	15	16	65	19	22	123	34	38
Other New England States,	7	6	5	7	6	3	14	12	8
Other States,	4	2	4	10	10	8	14	12	12
Total native,	69	23	25	82	35	33	151	58	58
Other countries: —									
Austria,	–	–	–	1	1	–	1	1	–
Australia,	–	–	1	–	–	–	–	–	1
Belgium,	1	1	1	–	–	–	1	1	1
Canada,	20	29	32	17	23	25	37	52	57
England,	3	4	3	4	4	4	7	8	7
Finland,	1	2	2	–	–	–	1	2	2
France,	–	1	–	1	2	2	1	3	2
Germany,	–	1	–	1	7	9	1	8	9
Greece,	5	5	5	–	–	–	5	5	5
Holland,	–	–	–	1	1	1	1	1	1
Ireland,	9	27	27	14	33	32	23	60	59
Italy,	5	7	7	4	4	4	9	11	11
Japan,	1	1	1	–	–	–	1	1	1
Poland,	2	2	2	4	5	5	6	7	7
Portugal,	2	3	4	1	4	2	3	7	6
Roumania,	1	1	1	–	–	–	1	1	1
Russia,	19	23	20	6	8	7	25	31	27
Scotland,	1	3	1	1	4	3	2	7	4
South America,	–	1	–	1	–	–	1	1	–
Spain,	–	1	–	–	–	–	–	1	–
Sweden,	1	4	3	–	3	2	1	7	5
Switzerland,	–	–	–	–	1	1	–	1	1
Wales,	–	–	2	–	–	1	–	–	3
West Indies,	1	1	1	–	–	–	1	1	1
Total foreign,	72	117	113	56	100	98	128	217	211
Unknown,	–	1	3	–	3	7	–	4	10
Grand totals,	141	141	141	138	138	138	279	279	279

TABLE 5. — *Residence of Patients admitted.*

PLACE.	Number.	PLACE.	Number.
Amesbury,	1	Malden,	16
Andover,	1	Marlborough,	2
Arlington,	2	Medford,	3
Ashburnham,	1	Melrose,	3
Athol,	1	Methuen,	3
Bedford,	1	Middleton,	1
Belmont,	4	Milford,	2
Beverly,	2	Milton,	1
Boston,	97	Natick,	1
Cambridge,	3	Newton,	5
Chelsea,	6	North Reading,	3
Concord,	1	Norwood,	1
Danvers,	1	Peabody,	2
Dighton,	1	Pittsfield,	1
Dracut,	1	Quincy,	1
Essex,	1	Reading,	2
Everett,	13	Revere,	3
Fall River,	2	Rockport,	1
Foxborough,	1	Salem,	4
Framingham,	1	Somerville,	16
Gardner,	1	Stoneham,	1
Gloucester,	4	Townsend,	1
Haverhill,	3	Wakefield,	2
Holliston,	1	Waltham,	1
Hudson,	1	Watertown,	4
Ipswich,	1	Westford,	1
Lawrence,	10	Wilmington,	1
Leominster,	1	Winchester,	3
Lowell,	16	Woburn,	2
Lunenburg,	1	Total,	279
Lynn,	12		

TABLE 6. — *Occupation of Patients admitted.*

	Males.	Females.	Totals.
Attendant nurse,	–	5	5
Baker,	1	–	1
Blacksmith,	1	–	1
Bookbinder,	–	1	1
Bookkeeper,	2	4	6
Buyer,	1	–	1
Carpenter,	10	–	10
Cashier,	–	1	1
Chauffeur,	2	–	2
Cigarmaker,	1	–	1
Civil engineer,	1	–	1
Clerk,	6	8	14
Courier,	2	–	2
Curator,	1	–	1
Dressmaker,	–	3	3
Electric worker,	1	–	1
Elevatorman,	1	–	1
Expressman,	1	–	1
Factory worker,	14	11	25
Fireman (stationary),	1	–	1
Foundryman,	2	–	2
Housewife,	–	55	55
Housework,	–	15	15
Janitor,	1	–	1
Junk collector,	2	–	2
Laboratory worker,	1	–	1
Laborer,	10	–	10
Laundry worker,	1	3	4
Lens grinder,	1	–	1
Lineman,	2	–	2
Linotype operator,	1	–	1
Longshoreman,	1	–	1
Machinist,	10	–	10
Manager,	1	–	1
Mate,	2	–	2
Metal worker,	3	–	3
Mill worker,	6	4	10

TABLE 6. — *Occupation of Patients admitted* — Concluded.

	Males.	Females.	Totals.
Musician,	2	–	2
No occupation,	1	6	7
Nurse,	–	2	2
Nursemaid,	–	1	1
Painter,	2	–	2
Peddler,	2	–	2
Photographer,	2	–	2
Plumber,	2	–	2
Polisher (metal),	1	–	1
Porter,	2	–	2
Poultryman,	1	–	1
Printer,	1	–	1
Roofer,	1	–	1
Saleslady,	–	2	2
Salesman,	1	–	1
Shoemaker,	7	–	7
Shipper,	4	–	4
Soldier,	1	–	1
Steam fitter,	1	–	1
Stenographer,	–	5	5
Student,	1	6	7
Tailor,	4	–	4
Teacher,	–	1	1
Teamster,	4	–	4
Telephone operator,	–	2	2
Tinsmith,	1	–	1
Trainman,	4	–	4
Upholsterer,	1	–	1
Varnisher (piano),	1	–	1
Veterinary surgeon,	1	–	1
Waiter,	3	3	6
Totals,	141	138	279

TABLE 7. — *Condition on Admission.*

	Males.	Females.	Totals.
Incipient,	–	3	3
Moderately advanced,	67	76	143
Advanced,	70	57	127
Non-tuberculous,	2	–	2
Not determined,	2	2	4
Totals,	141	138	279

TABLE 8. — *Condition on Discharge.*

	Males.	Females.	Totals.
Arrested,	–	3	3
Apparently arrested,	3	11	14
Quiescent,	20	12	32
Improved,	58	42	100
Unimproved,	29	26	55
Died,	21	26	47
Not considered,	18	16	34
Non-tuberculous,	–	–	–
Totals,	149	136	285

TABLE 9. — *Deaths.*

Duration of Disease.	Males.	Females.	Totals.	Length of Residence at Sanatorium.		
				Males.	Females.	Totals.
Under 1 month,	–	–	–	–	3	3
1 to 2 months,	–	–	–	1	4	5
2 to 3 months,	–	–	–	2	2	4
3 to 4 months,	–	–	–	5	3	8
4 to 5 months,	–	1	1	1	1	2
5 to 6 months,	–	–	–	–	1	1
6 to 7 months,	1	–	1	–	–	–
7 to 8 months,	1	1	2	–	–	–
8 to 9 months,	–	–	–	1	1	2
9 to 10 months,	–	–	–	1	1	2
10 to 12 months,	1	–	1	–	2	2
12 to 18 months,	5	8	13	4	3	7
18 to 24 months,	2	2	4	3	–	3
Over 2 years,	11	14	25	3	5	8
Totals,	21	26	47	21	26	47

TABLE 10. — *Cause of Death.*

	Males.	Females.	Totals.
Tuberculosis of the lungs,	21	23	44
Mitral regurgitation of heart,	–	1	1
Parenchymatous nephritis,	–	1	1
Aortic insufficiency of heart and chronic interstitial nephritis,	–	1	1
Totals,	21	26	47

WESTFIELD STATE SANATORIUM.

RESIDENT OFFICERS.

HENRY D. CHADWICK, M.D., ... *Superintendent.*
ROY MORGAN, M.D., ... *Assistant Superintendent.*
HEMAN B. CHASE, M.D., ... *Physician.*
RUSSELL H. BETHELL, D.M.D., ... *Dentist.*
EMILY B. MORGAN, ... *Superintendent of Nurses.*
BENJAMIN J. SANDIFORD, ... *Chief Engineer.*
ROBERT J. GOLDBERG, ... *Farmer.*

REPORT OF THE SUPERINTENDENT.

To the Commissioner of Public Health.

I have the honor to submit the eleventh annual report of the Westfield State Sanatorium for the year ending Nov. 30, 1920.

DAYS OF TREATMENT.

The daily average number of patients has been 265.25. This is equivalent to 96,816 hospital days, and represents the busiest year and the greatest service that has been performed by the sanatorium since it was opened in 1910.

NUMBER TREATED AND CLASSIFICATION.

Three hundred and fourteen new patients were admitted. This, together with the 265 that remained in the sanatorium Dec. 1, 1919, makes a total of 579 patients that have received treatment during the year. Of those admitted, 26 per cent were classified as incipient, 37 per cent as moderately advanced and 36 per cent as advanced. Table No. 7 shows the subdivisions according to symptoms, A class meaning mild, B class moderate and C class severe. The daily average number of bed patients was 85, — 37 males and 48 females.

LENGTH OF RESIDENCE.

The average length of stay, considering all patients discharged, has been 312.5 days. This is 57.5 days less than the previous year. Table No. 8 shows the condition of patients discharged. The following comparison is interesting

as showing how the number of apparently arrested cases depends upon the average length of stay: —

	1918.	1919.	1920.
Average length of stay (days),	417	370	312
Apparently arrested cases (per cent),	47	44	43

There are many children that could be discharged after from three to six months' sanatorium care if they had suitable living conditions at home. Where such is not the case, we have to keep them a longer time to insure as complete an arrest as possible. We also in such cases try through local authorities to have the home conditions improved before the child is discharged.

Support of Patients.

Of the 314 patients admitted, 31 paid their own board, 189 were supported by cities and towns, 8 were State minor wards, 59 were State charges, and the status of 27 has not been determined. The receipts from private patients were $3,922.70, and from cities and towns, $38,264.49. The gross per capita cost of maintenance per week was $14.24. Deducting sales the per capita cost was $14.13. This is $1.68 more than 1919.

Gain in Weight.

Two hundred and nineteen patients, or 70 per cent, of those discharged gained; 92, or 30 per cent, failed to gain. The average of those that gained was 11.6 pounds. Separating the discharged patients into two groups, we find that 71 over sixteen years of age gained an average of 8.4 pounds; 148 under sixteen years of age gained an average of 12.6 pounds.

Dentistry.

The care of the patients' teeth occupies the full time of one dentist. His work is a very important adjunct to the medical care of the patients. Nearly every patient admitted needs dentistry in order to eliminate local sources of infection or to improve mastication. Dr. John McCoy, our former dentist, resigned on May 8 to go into private practice. He was succeeded by Dr. Russell H. Bethell. The following gives a summary of the work that has been done during the year: —

Number of patients examined,	318
Prophylaxis,	335
Amalgam fillings,	350
Cement fillings,	300
Temporary fillings,	80
Pulp cappings,	100
Treatments,	75

Surgical dressings and irrigations,	75
Canal dressings,	30
Canal fillings,	50
Extractions,	220
X-rays of teeth,	10
X-rays of antra,	1
Total operations and treatments,	1,944

Of the 318 patients examined, the work of 230 is completed.

Conditions on Discharge.

Of the 311 patients discharged, 43 per cent were apparently arrested, 16.7 per cent quiescent, 7.07 per cent improved, 14.4 per cent unimproved and 12.8 per cent died. Seventeen patients remained less than thirty days and were not considered in this tabulation.

Sanatorium School.

The craft shop is getting more popular with the adult patients each year. A large number of baskets have been made and they meet with a ready sale. The product of the shop sold during the past year has advertised the quality of the goods so well that we have customers for all the baskets that the patients can make. The money received is sufficient to purchase most of the material used, although many of the baskets are given to the patients who make them. The average school attendance has been as follows: —

Grade I,	11.509
Grade II,	14.467
Grade III,	13.980
Grade IV,	15.800
Grade V,	19.560
Grade VI,	16.970
Grade VII,	11.060
Grade VIII,	11.590
Domestic science,	6.900
Manual training,	16.800
Total,	138.636
Total enrollment,	371

Out-Patient Department.

We have maintained an out-patient examination service for several years. The number of patients that come for advice has steadily increased. This past year 118 patients came for examination, — 79 males and 39 females; 55 of them were found to have active pulmonary tuberculosis.

Since September a consultation clinic has been held monthly in each of the following cities, — Springfield, Holyoke, Pittsfield and Adams. In addition, examination clinics have been held in co-operation with the Hampden County

Tuberculosis Association in Three Rivers, Ludlow, West Springfield, Palmer, East Longmeadow and Westfield. A total of 148 people have been examined at these clinics, classified as follows: —

Active tuberculosis,	34
Further observation,	41
Healed or quiescent tuberculosis,	8
Negative,	65

Two other clinics were held at the requests of the boards of health of Chicopee and of Adams. At each of these, about 20 patients were examined.

We have also examined 160 undernourished children at the Fort Meadow School in Westfield and 120 pupils of the Thorndike School in Palmer. In each of these schools there were several children who had evidence of active tuberculosis. Twenty-eight per cent of the 700 children in the Fort Meadow School were found to be more than 7 per cent underweight. Of this number, about 80 were found on physical examination to have signs of bronchial gland tuberculosis. Most of these children would respond to home treatment if they were properly advised and directions were followed as to correcting faulty habits of diet and living. School nurses to follow up these infected children could do much to prevent later development of pulmonary tuberculosis.

Improvements.

During the past year we have torn down the old farmhouse and rebuilt upon its site a new farmhouse and dormitory for the head farmer and farm help. This much needed improvement will enable us to house our farm help in a comfortable manner. The old barn, which was on the property when purchased by the State, has always been an unsightly structure and of little use because it was so poorly constructed. We have remodeled it by removing the top of the fourth story, rebuilding the roof and floors and reinforcing the frame. It is now a very useful building.

An X-ray machine has been installed and has been of great value in the medical work of the institution. We feel that we can make a more careful diagnosis and treat our patients in a more scientific manner because of the aid we get from this equipment.

Additional Improvements requested.

A special appropriation has been requested to provide more fire protection by extending a 4-inch water main from the power house to the school and farm buildings and the installation of hydrants at advantageous points along the line.

I have renewed the request for the purchase of 28.8 acres of land owned by Rosina Pignatare, which adjoin our property. This is desirable for use as a natural play ground for the boys to keep them away from the highway and river, and one section is badly needed for a pasture. We have rented it for the past two years but cannot use it to the best advantage unless we own it.

ACKNOWLEDGMENTS.

Religious services have been held each Sunday by the Catholic, Protestant and Jewish chaplains. The same chaplains have continued in service for several years. Their interest in the work of the institution and their devotion to the patients' welfare are worthy of much praise.

I am much indebted to Dr. Frederick T. Clark of Westfield, oculist and oral surgeon, for his gratuitous service to many of our sanatorium patients. Correction of eye strain and operative treatment of nasal obstructions and sinus disease have benefited a number of patients, and their period of treatment in the sanatorium has thereby been much shortened.

For the conscientious service of the heads of the departments and the faithful work of their employees in carrying on the work of the institution, I am extremely grateful. It has been a trying year on account of the labor situation and the high prices of all supplies and materials, but in spite of these conditions we have cared for more patients than ever before and this work has been accomplished with fewer employees.

Respectfully submitted,

HENRY D. CHADWICK,
Superintendent.

TREASURER'S REPORT.

To the Commissioner of Department of Public Health.

I respectfully submit the following report of the finances of this institution for the fiscal year ending Nov. 30, 1920: —

CASH ACCOUNT.

Balance Dec. 1, 1919,			$198 41
Receipts.			
Institution Receipts.			
Board of inmates: —			
Private,	$3,922 70		
Cities and towns,	38,264 49		
		$42,187 19	
Sales: —			
Food,	$383 43		
Clothing and materials,	1 00		
Heat, light and power,	20 98		
Farm and stable: —			
Cows and calves,	$725 00		
Pigs and hogs,	113 00		
Vegetables,	11 75		
Sundries,	271 80		
	1,121 55		
Repairs, ordinary,	15 00		
		1,541 96	
Amounts carried forward,		$43,729 15	$198 41

Amounts brought forward,		$43,729 15	$198 41
Miscellaneous receipts: —			
Interest on bank balances,	$182 26		
Sundries,	35 09		
		217 35	
			43,946 50
Receipts from Treasury of Commonwealth.			
Maintenance appropriations: —			
Balance of 1919,		$5,447 48	
Advance money (amount on hand November 30),		10,000 00	
Approved schedules of 1920,		177,065 93	
			192,513 41
Special appropriations,			16,962 89
Total,			$253,621 21
Payments.			
To treasury of Commonwealth, institution receipts,			$43,946 50
Maintenance appropriations: —			
Balance November schedule, 1919,		$5,645 89	
Eleven months' schedules, 1920,		177,065 93	
November advances,		9,759 79	
			192,471 61
Special appropriations: —			
Approved schedules,			16,962 89
Balance Nov. 30, 1920: —			
In bank,		$202 35	
In office,		37 86	
			240 21
Total,			$253,621 21
MAINTENANCE.			
Appropriation, current year,			$196,503 00
Expenses (as analyzed below),			196,485 66
Balance reverting to treasury of Commonwealth,			$17 34
Analysis of Expenses.			
Personal services: —			
Henry D. Chadwick, superintendent,		$3,900 00	
Medical,		3,584 59	
Administration,		3,424 81	
Kitchen and dining-room service,		12,376 60	
Domestic,		6,838 02	
Ward service (male),		3,477 07	
Ward service (female),		10,379 75	
Industrial and educational department,		3,704 00	
Engineering department,		9,373 58	
Repairs,		2,926 31	
Farm,		20,108 90	
Stable, garage and grounds,		2,904 45	
			$82,998 08
Amount carried forward,			$82,998 08

Amount brought forward,		$82,998 08
Religious instruction: —		
Catholic,	$600 00	
Hebrew,	249 60	
Protestant,	340 00	
		1,189 60
Travel, transportation and office expenses: —		
Advertising,	$20 12	
Postage,	135 66	
Printing and binding,	8 31	
Stationery and office supplies,	587 09	
Telephone and telegraph,	699 11	
Travel,	380 16	
Freight,	10 93	
		1,841 38
Food: —		
Flour,	$2,529 77	
Cereals, rice, meal, etc.,	1,409 49	
Bread, crackers, etc.,	187 62	
Peas and beans (canned and dried),	417 54	
Macaroni and spaghetti,	96 39	
Potatoes,	555 50	
Meat,	13,127 21	
Fish (fresh, cured and canned),	1,505 44	
Butter,	3,816 71	
Butterine, etc.,	536 70	
Peanut butter,	31 33	
Cheese,	113 18	
Coffee,	449 06	
Tea,	134 30	
Cocoa,	70 85	
Milk (condensed, evaporated, etc.),	83 43	
Eggs (fresh),	6,956 20	
Egg powders, etc.,	102 96	
Sugar (cane),	2,465 12	
Fruit (fresh),	386 65	
Fruit (dried and preserved),	1,950 67	
Lard and substitutes,	873 13	
Molasses and syrups,	185 53	
Vegetables (fresh),	9 51	
Vegetables (canned and dried),	857 11	
Seasonings and condiments,	487 53	
Yeast, baking powder, etc.,	196 42	
Sundry foods,	168 48	
Freight,	264 47	
		39,968 30
Clothing and materials: —		
Boots, shoes and rubbers,	$110 23	
Clothing (outer),	541 74	
Clothing (under),	84 70	
Dry goods for clothing,	206 98	
Hats and caps,	2 00	
Socks and smallwares,	34 24	
		979 89
Amount carried forward,		$123,977 25

Amount brought forward,		$126,977 25
Furnishings and household supplies: —		
Beds, bedding, etc.,	$2,152 91	
Carpets, rugs, etc.,	200 49	
Crockery, glassware, cutlery, etc.,	1,051 14	
Dry goods and smallwares,	641 12	
Electric lamps,	261 66	
Furniture, upholstery, etc.,	391 81	
Kitchen and household wares,	1,247 45	
Laundry supplies and materials,	1,519 55	
Lavatory supplies and disinfectants,	1,573 40	
Table linen, paper napkins, towels, etc.,	599 74	
Sundries,	262 50	
Freight,	132 67	
		10,034 44
Medical and general care: —		
Books, periodicals, etc.,	$55 60	
Entertainments, games, etc.,	168 00	
Funeral expenses,	60 00	
Ice and refrigeration,	168 80	
Laboratory supplies and apparatus,	269 22	
Manual training supplies,	130 77	
Medicines (supplies and apparatus),	1,657 02	
Medical attendance (extra),	93 45	
School books and supplies,	266 92	
Sputum cups, etc.,	469 13	
Sundries,	1 40	
Freight,	25 56	
		3,365 87
Heat, light and power: —		
Coal (bituminous),	$7,936 93	
Freight and cartage,	5,374 81	
Coal (anthracite),	631 02	
Freight and cartage,	232 21	
Oil,	239 04	
Operating supplies for boilers and engines,	426 81	
Freight,	18 81	
		14,859 63
Farm: —		
Bedding materials,	$290 29	
Blacksmithing and supplies,	142 10	
Carriages, wagons and repairs,	68 11	
Dairy equipment and supplies,	174 07	
Fencing materials,	77 00	
Fertilizers,	855 57	
Grain, etc.,	8,801 68	
Hay,	2,291 82	
Harnesses and repairs,	34 26	
Cows,	947 50	
Rent,	25 50	
Spraying materials,	141 50	
Stable and barn supplies,	223 50	
Tools, implements, machines, etc.,	466 58	
Trees, vines, seeds, etc.,	346 08	
Amounts carried forward,	$14,885 56	$155,237 19

Amounts brought forward,	$14,885 56	$155,237 19
Farm — *Con.*		
Veterinary services, supplies, etc.,	102 87	
Freight,	576 46	
Tractor,	1,325 00	
		16,889 89
Garage, stable and grounds: —		
Motor vehicles,	$2,500 00	
Automobile repairs and supplies,	2,178 14	
Rent,	240 00	
Road work and materials,	26 74	
Tools, implements, machines, etc.,	16 95	
Trees, vines, seeds, etc.,	117 42	
Freight,	3 73	
		5,082 98
Repairs, ordinary: —		
Cement, lime, crushed stone, etc.,	$208 50	
Electrical work and supplies,	563 12	
Hardware, iron, steel, etc.,	835 97	
Labor (not on pay roll),	1,744 65	
Lumber, etc. (including finished products),	1,152 26	
Paint, oil, glass, etc.,	1,138 82	
Plumbing and supplies,	1,185 09	
Roofing and materials,	259 36	
Steam fittings and supplies,	1,569 82	
Tents, awnings, etc.,	80 35	
Tools, machines, etc.,	726 56	
Boilers, repairs,	86 07	
Engines, repairs,	205 08	
Sundries,	11 13	
Freight,	183 28	
		9,950 06
Repairs and renewals: —		
Asbestos slate roofing and labor,	$4,355 82	
Boiler instruments,	358 58	
X-ray apparatus,	2,239 16	
Repairs on house and barn,	2,371 98	
		9,325 54
Total expenses for maintenance,		$196,485 66

SPECIAL APPROPRIATIONS.

Appropriations for current year,	$24,090 00
Expended during the year (see statement below),	16,962 89
Balance Nov. 30, 1920, carried to next year,	$7,127 11

Object.	Act or Resolve.	Whole Amount.	Expended during Fiscal Year.	Total Expended to Date.	Balance at End of Year.
Purchase of land,	1920,	$1,890 00	-	-	$1,890 00
Remodeling farmhouse and dormitory.	1920,	10,000 00	$9,988 23	$9,988 23	11 77
Remodeling barn,	1920,	5,700 00	5,662 76	5,662 76	37 24
Installing engine and generator.	1920,	6,500 00	1,311 90	1,311 90	5,188 10
		$24,090 00	$16,962 89	$16,962 89	$7,127 11

Resources and Liabilities.

Resources.

Cash on hand,	$240 21	
November cash vouchers (paid from advance money), account of maintenance,	9,759 79	
		$10,000 00
Due from treasury of Commonwealth from available appropriation, account of November, 1920, schedule,		9,419 73
		$19,419 73

Liabilities.

Schedule of November bills,	$19,419 73

Per Capita.

During the year the average number of inmates has been 265.25.
Total cost for maintenance, $196,485.66.
Equal to a weekly per capita cost of $14.2453.
Receipt from sales, $1,541.96.
Equal to a weekly per capita of $0.1117.
All other institution receipts, $42,404.54.
Equal to a weekly per capita of $3.074.

Respectfully submitted,
Henry D. Chadwick,
Treasurer.

Examined and found correct as compared with the records in the office of the Auditor of the Commonwealth.

Alonzo B. Cook,
Auditor.

VALUATION.

Land,	$13,524 00
Buildings,	176,206 29
Miscellaneous,	50,487 77
Total,	$240,218 06
Personal estate,	88,945 29
Total valuation,	$329,163 35

SPECIAL REPORT.

The following special report is prepared in accordance with a resolution of the National Conference of Charities and Corrections, adopted May 15, 1906: —

Population.

	Males.	Females.	Totals.
Number received during the year,	162	152	314
Number passing out of the institution during the year,	162	149	311
Number at end of fiscal year in the institution,	131	135	266
Daily average attendance (*i.e.*, number of inmates actually present) during the year.	132.339	132.918	265.25
Average number of employees and officers during the year,	57	41	98

Expenditures.

Current expenses: —	
1. Salaries and wages,	$84,187 68
2. Clothing,	979 89
3. Subsistence,	39,968 30
4. Ordinary repairs,	9,950 06
5. Office, domestic and outdoor expenses,	61,399 73
Total,	$196,485 66
Extraordinary expenses: —	
1. Permanent improvements to existing buildings and construction,	16,962 89
Grand total,	$213,448 55

Summary of Current Expenses.

Total expenditures,	$213,448 55
Deducting extraordinary expenses,	16,962 89
	$196,485 66
Deducting amount of sales,	1,541 96
Total,	$194,943 70

Dividing this amount by the daily average number of patients — 265.25 — gives a cost for the year of $734.94, equivalent to an average weekly net cost of $14.13.

STATISTICAL TABLES.

TABLE 1. — *Admissions and Discharges.*

	Males.	Females.	Totals.
Number of patients admitted Dec. 1, 1919, to Nov. 30, 1920, inclusive.	162	152	314
Number of patients discharged Dec. 1, 1919, to Nov. 30, 1920, inclusive.	162	149	311
Number of deaths (included in preceding item),	-	-	-
Number in sanatorium Dec. 1, 1919,	131	132	263
Number remaining Nov. 30, 1920,	131	135	266

TABLE 2. — *Civil Condition of Patients admitted.*

	Males.	Females.	Totals.
Married,	30	19	49
Single,	125	126	251
Widowed,	7	7	14
Totals,	162	152	314

TABLE 3. — *Ages of Patients admitted.*

	Males.	Females.	Totals.
1 to 13 years,	72	77	149
13 to 20 years,	29	30	59
21 to 30 years,	22	23	45
31 to 40 years,	23	17	40
41 to 50 years,	11	3	14
51 to 60 years,	4	1	5
60 years,	1	1	2
Totals,	162	152	314

TABLE 4. — *Nativity and Parentage of Patients admitted.*

PLACES OF NATIVITY.	MALES.			FEMALES.			TOTALS.		
	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.
United States: —									
Massachusetts,	104	37	30	100	32	33	204	69	63
Other New England States,	10	8	9	10	7	12	20	15	21
Other States,	16	10	9	8	9	7	24	19	16
Total native,	130	55	48	118	48	52	248	103	100
Other countries: —									
Armenia,	–	1	1	1	1	1	1	2	2
Asia,	1	1	1	–	–	1	1	1	2
Austria,	1	5	5	–	2	2	1	7	6
Azores,	–	1	1	–	–	–	–	1	1
Bohemia,	–	–	1	–	–	–	–	–	1
Canada,	10	24	25	11	24	28	21	48	53
Czecho-Slovakia,	1	–	–	–	–	–	1	–	–
Denmark,	–	–	–	1	1	2	1	1	2
England,	3	5	4	1	5	4	4	10	8
Finland,	–	–	–	1	3	3	1	3	3
France,	1	1	1	–	–	1	1	1	2
Germany,	–	1	1	–	1	2	–	2	3
Greece,	–	2	2	–	1	1	–	3	3
Ireland,	3	23	26	3	23	21	6	46	47
Italy,	2	7	8	1	7	6	3	14	14
Poland,	–	3	2	3	5	4	3	8	6
Porto Rico,	1	–	–	–	–	–	1	–	–
Portugal,	–	2	2	–	1	1	–	3	3
Russia,	1	4	4	3	6	6	4	10	10
Scotland,	3	4	5	1	2	1	4	6	6
Sweden,	–	2	1	–	2	2	–	4	3
Switzerland,	–	–	–	–	1	1	–	1	1
Syria,	1	1	1	–	–	–	1	1	1
Turkey,	–	–	–	1	1	–	1	1	–
Wales,	–	1	–	–	–	–	–	1	–
West Indies,	–	–	1	–	–	–	–	–	1
Total foreign,	28	88	90	27	86	87	55	174	178
Unknown,	4	19	22	7	18	14	11	37	14
Grand total,	162	162	162	152	152	152	314	314	314

TABLE 5. — *Residence of Patients admitted.*

PLACE.	Number.	PLACE.	Number.
Adams,	4	Medford,	4
Amesbury,	1	Melrose,	1
Bedford,	1	Montague,	1
Beverly,	2	New Bedford,	5
Boston,	43	Newton,	2
Brockton,	2	North Adams,	7
Brookline,	1	Northampton,	4
Cambridge,	2	Northbridge,	1
Chelsea,	1	North Brookfield,	1
Chicopee,	4	Norwood,	1
Concord,	1	Peabody,	1
Dartmouth,	1	Pittsfield,	8
Dennis,	1	Plymouth,	1
Dudley,	1	Quincy,	1
East Bridgewater,	1	Salem,	2
Easthampton,	3	Somerville,	5
Everett,	7	Southbridge,	3
Fall River,	13	South Hadley,	4
Falmouth,	1	Spencer,	1
Fitchburg,	8	Springfield,	42
Gardner,	2	Templeton,	1
Gloucester,	8	Tewksbury,	2
Grafton,	2	Tyngsborough,	1
Greenfield,	3	Uxbridge,	2
Haverhill,	1	Watertown,	2
Holyoke,	8	Webster,	4
Hudson,	1	Westborough,	1
Lancaster,	1	Westfield,	13
Lawrence,	3	Westfield State Sanatorium,	4
Leominster,	10	Westford,	1
Longmeadow,	1	West Springfield,	5
Lowell,	6	Williamstown,	1
Ludlow,	2	Winchester,	2
Lynn,	12	Worcester,	12
Malden,	3	Total,	314
Marlborough,	7		

TABLE 6. — *Occupations of Patients admitted.*

	Males.	Females.	Totals.
Baker,	1	–	1
Bookbinder,	1	–	1
Cabinetmaker,	1	–	1
Car inspector,	1	–	1
Carpenter,	4	–	4
Chauffeur,	3	–	3
Cigarmaker,	1	–	1
Civil engineer,	1	–	1
Clerk,	7	2	9
Domestic,	–	3	3
Dyer,	1	–	1
Errand boy,	1	–	1
Gardener,	1	–	1
Hospital attendant,	–	3	3
Hotel clerk,	2	–	2
Housewife,	–	20	20
Janitor,	1	–	1
Laborer,	2	–	2
Machinist,	4	–	4
Marble cutter,	1	–	1
Meat cutter,	1	–	1
Mill hand,	14	14	28
Nurse,	2	4	6
Office,	–	1	1
Orderly,	2	–	2
Painter,	3	–	3
Paper worker,	2	–	2
Plumber,	1	–	1
Printer,	3	–	3
Salesman,	2	–	2
School,	85	94	179
Shipping clerk,	2	–	2
Shoemaker,	2	–	2
Steelworker,	1	–	1
Stenographer,	–	1	1
Stonecutter,	1	–	1
Teacher,	–	1	1

TABLE 6. — *Occupations of Patients admitted* — Concluded.

	Males.	Females.	Totals.
Teamster,	1	–	1
Telephone operator,	–	1	1
Toolmaker,	1	–	1
Waiter,	1	3	4
Weaver,	1	–	1
None,	4	5	9
Totals,	162	152	314

TABLE 7. — *Condition on Admission.*

	Males.	Females.	Totals.
Incipient: —			
A,	39	38	77
B,	2	4	6
C,	–	1	1
Moderately advanced: —			
A,	35	39	74
B,	25	18	43
C,	–	–	–
Far advanced: —			
A,	28	26	54
B,	26	18	44
C,	7	7	14
Nontuberculous,	–	1	1
Totals,	162	152	134

TABLE 8. — *Condition on Discharge.*

	Males.	Females.	Totals.
Apparently arrested,	70	64	134
Quiescent,	30	22	52
Improved,	13	9	22
Unimproved,	18	27	45
Died,	20	20	40
Nontuberculous,	–	1	1
Not considered (stayed less than thirty days),	11	6	17
Totals,	162	149	311

TABLE 9. — *Deaths.*

Duration of Disease.	Males.	Females.	Totals.	Length of Residence at Sanatorium.		
				Males.	Females.	Totals.
Under 1 month,	–	–	–	1	–	1
1 to 3 months,	–	–	–	2	–	2
3 to 6 months,	3	–	3	7	3	10
6 to 9 months,	2	1	3	1	10	11
9 months to 1 year,	–	2	2	5	2	7
1 to 2 years,	5	10	15	3	3	6
2 to 5 years,	4	4	8	1	2	3
5 to 10 years,	6	2	8	–	–	–
Over 10 years,	–	1	1	–	–	–
Totals,	20	20	40	20	20	40

TABLE 10. — *Cause of Death.*

	Males.	Females.	Totals.
Tuberculosis of lungs,	17	17	34
Tuberculosis of lungs and bowels,	1	–	1
Tuberculosis of lungs and kidney,	–	1	1
Tuberculosis of lungs and larynx,	1	1	2
Tuberculosis of lungs, kidney and larynx,	–	1	1
Accidental drowning,	1	–	1
Totals,	20	20	40

LAKEVILLE STATE SANATORIUM.

RESIDENT OFFICERS.

SUMNER COOLIDGE, M.D., ... *Superintendent.*
MINOT W. GALE, M.D., ... *Assistant Superintendent.*
FREDERICK P. MOORE, M.D., ... *Senior Assistant Physician.*
MRS. MARY M. COAKLEY, ... *Steward.*
MRS. HARRIET M. GASSETT, ... *Head Matron.*
ROBERT A. KENNEDY, ... *Operating Engineer.*
THOMAS FRANCIS MAHONEY, ... *Head Farmer.*

REPORT OF THE SUPERINTENDENT.

To the Commissioner of Public Health.

I have the honor to submit herewith the report of the Lakeville State Sanatorium for the year ending Nov. 30, 1920.

There were remaining in the institution on Nov. 30, 1919, 232 patients. This, together with 504 admitted during the year, brings the total number of patients cared for to 736, as against 704 for the year 1919.

The daily average number of patients for the year has been 231, which shows that we carried 19 more empty beds throughout the year than in any previous year since the institution was opened, a total daily average of 42.

The average stay of 485 patients discharged was 176⅔ days, or 13⅓ days less than the previous year. The longest residence was 2,393 days and the shortest was 1 day.

The average of 104.8 bed patients daily maintains approximately the percentage of the previous year, showing that as the years pass we are taking care of sicker patients, as a whole, than in former years.

The total days of treatment for the year just finished was 84,671, 7,305 less than in 1919.

The following table showing the classification of cases admitted indicates no improvement in the class of patients cared for, and also shows discrepancies between the sanatorium classification and that of the outside practitioners.

	Classification on Application Blank.	Our Classification on Admission.
Incipient,	38	3
Moderately advanced,	340	274
Far advanced,	110	207
Not classified,	15	17
Apparently arrested,	1	1
Not examined,	–	2
Totals,	504	504

Table 8 shows a slight improvement over the preceding year in the condition of patients discharged.

Of the 736 cases cared for, the proportion of self-supporting cases shows a slight improvement over 1919. There were 75 private cases, 273 town cases, and 144 State cases. The unusually large number of 200 settlements still remain undetermined at the end of the year. Forty-six ex-service men have been cared for, of whom 44 were acknowledged by the Bureau of War Risk Insurance.

Of the 485 patients discharged during the year, 196 made an average gain of 14.13 pounds. The greatest gain for a man was 45½ pounds and for a woman 43¼ pounds.

Medical Report.

No innovations have been introduced in medical treatment during the year. Heliotherapy has been practiced as in the previous year, although the complications calling for this treatment have been fewer than in 1919.

As usual tubercular laryngitis heads the list of complications. There were 65 cases of this complication, 14 cases of fistula in ano, 11 cases of tubercular adenitis, 7 cases of pleurisy, 7 cases of tubercular peritonitis, and 5 cases of nephritis. Besides these cases 32 other distinct complications were met with.

Of 3,017 sputum examinations, 1,084 were positive and 1,933 were negative.

Six hundred and twenty-five urinalyses were made, which disclosed 5 cases of nephritis and 1 of diabetes.

The tuberculosis clinic at Middleborough was discontinued in July and was not resumed in the autumn because the field was covered by the consultation clinic plan which was instituted in September.

Work performed.

An attempt was made to continue occupational therapy throughout the year by the assignment of suitable patients to small duties of a helpful character. The results have been fragmentary on account of the small number of patients who were well enough to put on regular exercise.

The aggregate number of work hours of patients during the year was 9,700, 1,304 hours less than in 1919. The following list of canned goods represents the combined work of the janitor's department with the patients.

Farm Produce canned and preserved.

	Cans, No. 10.	Cans, No. 3.	2-quart Cans.	Pounds.	Barrels.
Strawberries,	146	–	–	–	–
Cherries,	20	–	–	–	–
Plums	249	–	–	–	–
Pears,	158	–	–	–	–
String beans,	564	–	–	–	–
Lima beans,	231	–	–	–	–
Peas,	152	616	–	–	–
Corn,	–	1,307	–	–	–
Tomatoes,	1,516	–	–	–	–
Ketchup,	–	–	141	–	–
Piccalilli,	–	–	327	–	–
Currant jelly,	–	–	–	1,400	–
Cucumber pickles,	–	–	–	–	6
	3,036	1,923	468	1,400	6

Improvements.

An appropriation was made available during the year for the purchase of an 80-kilowatt generator unit and for a temporary shelter for young stock at the dairy barn. Plans were completed for the installation of the generator and it was ordered in midsummer. Delivery has been delayed, however, so that at this writing the machine has not yet been shipped. The necessary provision has been made for the protection of young stock by building a part of the permanent foundation of the addition at the dairy barn which was requested.

The sewerage system has been extended by the addition of 800 feet of absorption trenches, and 3,600 square yards of road about the sanatorium grounds have been macadamized.

Farm.

The results obtained on the farm during the year just ended have been fairly satisfactory. The earliest planted garden crops were considerably damaged by the cold and rain, but the main crops have been of good quality and of average quantity.

By improved methods in the curing of bacon and ham we are now in a position to produce all classes of pork products which are used in the sanatorium, and the installation of illumination in the poultry plant has already shown remarkable results in egg production.

Recommendations.

Again our first recommendation is that the institution be provided with an adequate storehouse. Present conditions under which supplies are stored and handled are unbusinesslike and wasteful as the supplies cannot be properly protected, and handling under present conditions is very expensive. Estimated cost, $1,200.

Our next recommendation in order of importance is an addition to the dairy barn to provide storage for hay produced on the farm and to provide quarters for young stock which it is necessary for us to raise if we are to eradicate tuberculosis from the herd. Estimated cost, $9,500.

I also recommend the erection of a 30,000-gallon tank for additional water supply, and a duplicate pumping unit at the pumping station.

There is very urgent need for a moving-picture apparatus, and an X-ray equipment. The moving picture should be installed at once.

The chapel should be enlarged by extending the building about 20 or 25 feet in a southerly direction, providing anterooms for the various uses of entertainers, speakers and clergymen who serve us from time to time. This enlargement will also furnish an excellent room for the X-ray apparatus.

The poultry plant should be made more complete by slightly increasing its capacity, and by the installation of an incubation plant. It does not seem reasonable to spend $1,200 or $1,300 per year for day old chicks when the same can be hatched on the place at about half that cost.

I urgently recommend also a definite policy in regard to the providing of quarters by the institution for permanent married employees. In Lakeville this may best be done by purchasing a small property which will soon come into the market, with two houses already built, and the purchase of a small lot situated conveniently near to the sanatorium for the erection of new houses.

The farm is adequate if the available good land can be reclaimed, although it has not sufficient pasturage. Additional pasture land is available adjoining the dairy farm which should be purchased as soon as practicable.

Changes in Personnel.

During the year the resignation of Dr. George M. Sullivan was accepted, and Dr. Minot W. Gale, then assistant physician, was promoted to the position of assistant superintendent. For the position of assistant physician made vacant by the promotion of Dr. Gale we were fortunate in obtaining the services of Dr. Frederick P. Moore, formerly assistant superintendent of the Norfolk State Hospital.

Acknowledgments.

I wish to express my appreciation of the faithful services of the Catholic, Protestant and Jewish clergymen who have attended to their respective religious ministrations during the year.

The heads of departments and their subordinates have maintained a helpful attitude through the hardest year in the history of the institution.

Gifts of flowers and books to the patients are also gratefully acknowledged.

Respectfully submitted,

Sumner Coolidge,
Superintendent.

TREASURER'S REPORT.

To the Commissioner of Public Health.

I respectfully submit the following report of the finances of this institution for the fiscal year ending Nov. 30, 1920: —

Cash Account.

Balance Dec. 1, 1919,		$314 81
Receipts.		
Institution Receipts.		
Board of inmates: —		
Private,	$4,193 06	
Cities and towns,	29,753 90	
Reimbursements, charitable,	246 28	
Other reimbursements, War Risk patients' board,	380 86	
	$34,574 10	
Amounts carried forward,	$34,574 10	$314 81

Amounts brought forward,		$34,574 10	$314 81
Sales: —			
Travel, transportation and office expenses,	$89 85		
Clothing and materials,	60 00		
Furnishings and household supplies,	63 31		
Medical and general care,	21 18		
Farm and stable: —			
Cows and calves,	$40 00		
Grease,	514 72		
Hides,	12 76		
Vegetables,	128 40		
Use of teams,	2 25		
Sundries,	133 19		
	831 32		
Repairs, ordinary,	4 50		
		1,070 16	
Miscellaneous receipts: —			
Interest on bank balances,		164 14	
			35,808 40
Receipts from Treasury of Commonwealth.			
Maintenance appropriations: —			
Balance of 1919,		$7,625 10	
Advance money (amount on hand November 30),		8,000 00	
Approved schedules of 1920,		182,943 98	
			198,569 08
Special appropriations,			1,932 38
Total,			$236,624 67

Payments.

To treasury of Commonwealth: —			
Institution receipts,		$35,808 40	
Refunds, account of maintenance,		158 43	
Income account of 1919 not paid over until 1920 account,		23 40	
			$35,990 23
Maintenance appropriations: —			
Balance November schedule, 1919,		$7,918 94	
Eleven months' schedules, 1920,	$182,943 98		
Less returned,	158 43		
		182,785 55	
November advances,		3,498 32	
			194,202 81
Special appropriations: —			
Approved schedules,		$1,932 38	
Less returned,		2 43	
			1,929 95
Balance Nov. 30, 1920: —			
In bank,		$4,240 99	
In office,		260 69	
			4,501 68
Total,			$236,624 67

MAINTENANCE.

Appropriation, current year,	$201,810 48
Expenses (as analyzed below),	198,740 87
Balance reverting to treasury of Commonwealth,	$3,069 61

Analysis of Expenses.

Personal services: —		
Sumner Coolidge, M.D., superintendent,	$3,600 00	
Medical,	3,637 74	
Administration,	5,061 91	
Kitchen and dining-room service,	5,545 03	
Domestic,	16,221 36	
Ward service (male),	6,301 01	
Ward service (female),	5,482 64	
Engineering department,	7,202 57	
Repairs,	4,970 43	
Farm,	26,231 45	
Stable, garage and grounds,	1,990 97	
		$86,245 11
Religious instruction: —		
Catholic,	$600 00	
Hebrew,	101 44	
Protestant,	430 00	
		1,131 44
Travel, transportation and office expenses: —		
Postage,	$177 44	
Printing and binding,	163 38	
Stationery and office supplies,	413 11	
Telephone and telegraph,	320 64	
Travel,	781 22	
Sundries,	75 98	
Freight,	15 60	
		1,947 37
Food: —		
Flour,	$2,972 56	
Cereals, rice, meal, etc.,	852 27	
Bread, crackers, etc.,	88 17	
Peas and beans (canned and dried),	400 14	
Macaroni and spaghetti,	73 02	
Potatoes,	444 25	
Meat,	10,838 23	
Fish (fresh, cured and canned),	2,171 58	
Butter,	4,586 00	
Cheese,	148 96	
Coffee,	399 63	
Tea,	170 07	
Cocoa,	50 59	
Milk (condensed, evaporated, etc.),	39 60	
Eggs (fresh),	2,084 55	
Sugar (cane),	3,882 31	
Fruit (fresh),	296 81	
Fruit (dried and preserved),	256 06	
Amounts carried forward,	$29,754 80	$89,323 92

Amounts brought forward,	$29,754 80	$89,323 92
Food — *Con.*		
Lard and substitutes,	434 50	
Molasses and syrups,	44 51	
Vegetables (fresh),	77 55	
Seasonings and condiments,	723 90	
Yeast, baking powder, etc.,	137 54	
Sundry foods,	53 02	
Freight,	545 36	
		31,771 18
Clothing and materials: —		
Boots, shoes and rubbers,	$1 50	
Clothing (outer),	13 10	
Freight,	35	
		4 95
Furnishings and household supplies: —		
Beds, bedding, etc.,	$650 66	
Carpets, rugs, etc.,	187 06	
Crockery, glassware, cutlery, etc.,	464 56	
Dry goods and smallwares,	346 94	
Electric lamps,	197 11	
Furniture, upholstery, etc.,	225 82	
Kitchen and household wares,	1,977 62	
Laundry supplies and materials,	750 40	
Lavatory supplies and disinfectants,	518 26	
Table linen, paper napkins, towels, etc.,	445 98	
Sundries,	54 46	
Freight,	127 21	
		5,946 08
Medical and general care: —		
Books, periodicals, etc.,	$30 13	
Entertainments, games, etc.,	324 25	
Funeral expenses,	228 50	
Ice and refrigeration,	187 74	
Laboratory supplies and apparatus,	212 16	
Medicines (supplies and apparatus),	2,120 50	
Medical attendance (extra),	13 50	
Sputum cups, etc.,	712 56	
Sundries,	3 00	
Freight,	34 01	
		3,866 35
Heat, light and power: —		
Coal (bituminous),	$6,790 59	
Freight and cartage,	4,249 60	
Coal (anthracite),	366 74	
Freight and cartage,	335 18	
Oil,	474 99	
Operating supplies for boilers and engines,	398 05	
Sundries,	180 05	
Freight,	31 84	
		12,827 04
Amount carried forward,		$143,749 52

Amount brought forward,		$143,749 52
Farm: —		
Bedding materials,	$229 34	
Blacksmithing and supplies,	248 64	
Carriages, wagons and repairs,	68 12	
Dairy equipment and supplies,	455 04	
Fencing materials,	226 44	
Fertilizers,	4,266 24	
Grain, etc.,	18,046 34	
Hay,	4,574 64	
Harnesses and repairs,	244 20	
Cows,	890 00	
Other live stock,	947 58	
Labor (not on pay roll),	1,527 14	
Rent,	303 76	
Spraying materials,	308 06	
Stable and barn supplies,	237 53	
Tools, implements, machines, etc.,	2,026 86	
Trees, vines, seeds, etc.,	1,108 35	
Veterinary services, supplies, etc.,	223 56	
Sundries,	407 76	
Freight,	2,897 28	
		39,236 88
Garage, stable and grounds: —		
Motor vehicles,	$3,792 50	
Automobile repairs and supplies,	2,515 45	
Carriages, wagons and repairs,	498 56	
Road work and materials,	212 37	
Spraying materials,	27 75	
Tools, implements, machines, etc.,	448 15	
Trees, vines, seeds, etc.,	257 53	
Freight,	114 85	
		7,867 16
Repairs, ordinary: —		
Brick,	$9 60	
Cement, lime, crushed stone, etc.,	608 61	
Electrical work and supplies,	437 50	
Hardware, iron, steel, etc.,	723 43	
Labor (not on pay roll),	509 41	
Lumber, etc. (including finished products),	1,309 45	
Paint, oil, glass, etc.,	1,196 02	
Plumbing and supplies,	477 11	
Roofing and materials,	217 32	
Steam fittings and supplies,	124 47	
Tents, awnings, etc.,	313 38	
Tools, machines, etc.,	583 92	
Boilers, repairs,	194 45	
Dynamos, repairs,	154 93	
Engines, repairs,	196 00	
Sundries,	100 29	
Freight,	77 36	
		7,233 25
Repairs and renewals: —		
Repair old house,		654 06
Total expenses for maintenance,		$198,740 87

SPECIAL APPROPRIATIONS.

Balance Dec. 1, 1919,	$2,500 00
Appropriations for current year,	11,505 00
Total,	$14,005 00
Expended during the year (see statement below),	1,849 82
Balance Nov. 30, 1920, carried to next year,	$12,155 18

OBJECT.	Act or Resolve.	Whole Amount.	Expended during Fiscal Year.	Total Expended to Date.	Balance at End of Year.
Shelter for young stock,	Chap. 629, 1920,	$2,500 00	$1,696 52	$1,696 52	$803 48
Generator unit,	Chap. 629, 1920,	9,005 00	153 30	153 30	8,851 70
Purchase of land,	Chap. 153, 1919,	2,500 00	-	-	2,500 00
		$14,015 00	$1,849 82	$1,849 82	$12,155 18

RESOURCES AND LIABILITIES.

Resources.

Cash on hand,	$4,501 68	
November cash vouchers (paid from advance money), account of maintenance,	3,498 32	
		$8,000 00
Due from treasury of Commonwealth from available appropriation, account of November, 1920, schedule,		7,796 89
		$15,796 89

Liabilities.

Schedule of November bills,	$15,796 89

PER CAPITA.

During the year the average number of inmates has been 231.34.
Total cost for maintenance, $198,740.87.
Equal to a weekly per capita cost of $16.520.
Receipt from sales, $1,070.16.
Equal to a weekly per capita of $0.0889.
All other institution receipts, $34,738.24.
Equal to a weekly per capita of $2.8877.

Respectfully submitted,
SUMNER COOLIDGE,
Treasurer.

Examined and found correct as compared with the records in the office of the Auditor of the Commonwealth.

ALONZO B. COOK,
Auditor.

VALUATION.

Land.

Grounds (63 acres),	$8,868 50	
Woodland (10 acres),	535 70	
Mowing (42 acres),	2,019 25	
Tillage (53 acres),	4,502 90	
Orchard (5 acres),	442 66	
Pasture (13 acres),	696 41	
Waste and miscellaneous (23 acres),	1,018 96	
		$18,084 38

Buildings and Equipment.

Institution and buildings,	$117,394 50	
Farm, stable and grounds,	23,642 87	
Miscellaneous,	83,782 88	
		224,820 25
		$242,924 63
Present value of all personal property as per inventory of Nov. 30, 1920,		115,192 25
Grand total,		$358,116 88

SPECIAL REPORT.

The following report is prepared in accordance with a resolution of the National Conference of Charities and Corrections, adopted May 15, 1906: —

Population.

	Males.	Females.	Totals.
Number of patients at beginning of year,	150	82	232
Number received during year,	351	153	504
Number discharged or died during the year,	424	192	616
Number at end of fiscal year,	166	85	251
Daily average attendance (*i.e.*, number of inmates actually present) during the year.	206	129	335
Average number of officers and employees during the year,	94	24	118

Expenditures.

Current expenses: —		
1. Salaries and wages,	$86,245 11	
2. Clothing,	14 95	
3. Subsistence,	31,771 18	
4. Ordinary repairs and improvements,	7,887 31	
5. Office, domestic and outdoor expenses,	72,822 32	
Total,		$198,740 87
Extraordinary expenses: —		
1. Shelter for young stock,	$1,696 52	
2. Generator unit,	153 30	
		1,849 82
Grand total,		$200,590 69

Summary of Current Expenses.

Total expenditures,	$200,590 69
Deducting extraordinary expenses,	1,849 82
	$198,740 87
Deducting amount of sales,	1,070 16
Total,	$197,670 71

Dividing this amount by the daily average number of patients — 231.34 — gives a cost for the year of $854.459, equivalent to an average weekly net cost of $16.434.

STATISTICAL TABLES.

TABLE 1. — *Admissions and Discharges.*

	Males.	Females.	Totals.
Number of patients admitted Dec. 1, 1919, to Nov. 30, 1920, inclusive.	351	153	504
Number of patients discharged Dec. 1, 1919, to Nov. 30, 1920, inclusive.	335	150	485
Number of deaths (included in preceding item),	89	42	131
Number remaining in sanatorium Nov. 30, 1920,	166	85	251
Daily average number of bed patients Dec. 1, 1919, to Nov. 30, 1920.	58	46	104
Daily average number of patients,	148	83	231

TABLE 2. — *Civil Condition of Patients admitted.*

	Males.	Females.	Totals.
Married,	160	79	239
Single,	170	65	235
Widowed,	18	6	24
Divorced,	3	3	6
Totals,	351	153	504

TABLE 3. — *Age of Patients admitted.*

	Males.	Females.	Totals.
14 to 20 years,	19	22	41
20 to 30 years,	124	66	190
30 to 40 years,	91	43	134
40 to 50 years,	80	17	97
Over 50 years,	37	5	42
Totals,	351	153	504

TABLE 4. — *Nativity and Parentage of Patients admitted.*

PLACES OF NATIVITY.	MALES.			FEMALES.			TOTALS.		
	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.
United States: —									
Massachusetts,	121	37	31	65	19	20	186	56	51
Other New England States,	17	13	12	10	9	5	27	22	17
Other States,	18	10	16	12	15	17	30	25	33
Total native,	156	60	59	87	43	42	243	103	101
Other countries: —									
Albania,	1	1	1	–	–	–	1	1	1
Armenia,	7	7	7	–	–	–	7	7	7
Austria,	2	2	2	–	–	–	2	2	2
Azores,	1	1	1	–	–	–	1	1	1
Canada,	28	41	44	8	12	13	36	53	57
Cape Verde Islands,	4	4	4	–	–	–	4	4	4
China,	1	1	1	–	–	–	1	1	1
Denmark,	–	1	1	–	–	–	–	1	1
England,	7	11	9	7	10	7	14	21	16
Europe,	–	–	–	1	1	1	1	1	1
Finland,	4	5	5	3	3	3	7	8	8
France,	–	2	1	–	–	–	–	2	1
Germany,	–	4	1	1	1	1	1	5	2
Greece,	17	17	17	2	2	2	19	19	19
Ireland,	21	62	69	13	35	39	34	97	108
Italy,	26	29	30	4	5	5	30	34	35
Lithuania,	1	2	2	1	1	1	2	3	3
Madeira,	–	–	–	1	1	1	1	1	1
Newfoundland,	1	3	3	1	1	1	2	4	4
Norway,	4	4	4	1	1	1	5	5	5
Nova Scotia,	6	12	14	7	10	11	13	22	25
Poland,	10	10	11	2	5	5	12	15	16
Portugal,	6	6	6	4	4	4	10	10	10
Russia,	29	32	29	7	8	8	36	40	37
Scotland,	5	10	7	2	3	3	7	13	10
Spain,	1	1	1	–	–	–	1	1	1
Sweden,	7	12	10	–	2	2	7	14	12
Switzerland,	–	–	1	–	–	–	–	–	1
Syria,	3	3	3	1	1	1	4	4	4
Turkey,	2	2	2	–	–	–	2	2	2
West Indies,	–	–	–	–	–	1	–	–	1
Total foreign,	194	285	286	66	106	110	260	391	396
Unknown,	1	6	6	–	4	1	1	10	7
Grand totals,	351	351	351	153	153	153	504	504	504

TABLE 5. — *Residence of Patients admitted.*

PLACE.	Number.	PLACE.	Number.
Adams,	2	Leominster,	5
Andover,	2	Lexington,	1
Arlington,	4	Longmeadow,	1
Athol,	2	Lowell,	19
Avon,	1	Lynn,	13
Bedford,	1	Malden,	10
Belmont,	2	Marblehead,	1
Beverly,	2	Marlborough,	6
Boston,	169	Maynard,	1
Braintree,	1	Medford,	1
Bridgewater,	4	Merrimac,	1
Brockton,	11	Methuen,	1
Buffalo, N. Y.,	1	Middleborough,	10
Cambridge,	12	Milford,	4
Chelmsford,	1	Millbury,	1
Chelsea,	11	Natick,	1
Clinton,	1	Needham,	1
Concord,	1	New Bedford,	26
Danvers,	2	Newton,	6
Dedham,	2	Northbridge,	2
Essex,	2	Norton,	1
Everett,	9	Norwood,	2
Fairhaven,	1	Ormbay, Conn.,	1
Fall River,	23	Pawtucket, R. I.,	1
Framingham,	4	Peabody,	5
Freetown,	1	Providence, R. I.,	1
Gardner,	5	Quincy,	10
Gay Head,	1	Randolph,	1
Gloucester,	5	Reading,	1
Hardwick,	1	Revere,	4
Haverhill,	3	Rockport,	1
Holderness, N. H.,	1	Saugus,	1
Holyoke,	1	Somerset,	1
Hopkinton,	1	Somerville,	12
Hudson,	1	Southbridge,	1
Lakeville,	1	Spencer,	1
Lawrence,	9	Springfield,	1

TABLE 5. — *Residence of Patients admitted* — Concluded.

PLACE.	Number.	PLACE.	Number.
Stoneham,	1	Watertown,	2
Stoughton,	1	Webster,	4
Sturbridge,	1	Westborough,	1
Taunton,	6	Weston,	1
Upton,	1	Winchendon,	1
Wakefield,	2	Winchester,	1
Walpole,	2	Woburn,	1
Waltham,	1	Worcester,	20
Warren,	1	Total,	504

TABLE 6. — *Occupations of Patients admitted.*

	Males.	Females.	Totals.
Actor,	1	–	1
Agricultural extension leader,	1	–	1
Attendant,	–	4	4
Baker,	2	–	2
Barber,	5	–	5
Beltmaker,	1	–	1
Blacksmith,	1	–	1
Bookbinder,	–	1	1
Bookkeeper,	–	2	2
Brakeman,	2	–	2
Brassworker,	1	–	1
Bricklayer,	1	–	1
Brickmason,	1	–	1
Butcher,	1	–	1
Butler,	1	–	1
Cabinetmaker,	3	–	3
Canvasser,	1	–	1
Card room in mill,	1	–	1
Car inspector,	1	–	1
Carpenter,	4	–	4
Chair shop,	2	–	2
Chauffeur,	5	–	5

TABLE 6. — *Occupations of Patients admitted* — Continued.

	Males.	Females.	Totals.
Chemical laboratory worker,	1	–	1
Chorus girl,	–	1	1
Cigarmaker,	1	–	1
Clerk,	23	1	24
Coal passer,	1	–	1
Coal sampler,	1	–	1
Cobbler,	1	–	1
Conductor,	1	–	1
Contractor,	1	–	1
Cook,	4	–	4
Coppersmith,	1	–	1
Corset factory,	–	2	2
Cotton factory,	2	7	9
Creamery hand,	1	–	1
Dairyman,	1	–	1
Domestic,	–	3	3
Draftsman,	1	–	1
Dressmaker,	–	1	1
Driver,	1	–	1
Druggist,	1	–	1
Electrical salesman,	1	–	1
Electrician,	3	–	3
Engineer,	6	–	6
Errand boy,	1	–	1
Expressman,	1	–	1
Factory,	1	3	4
Farmer,	4	–	4
Fireman,	1	–	1
Fisherman,	2	–	2
Foreman shoe factory,	1	–	1
Freight carrier,	1	–	1
Fruit dealer,	3	–	3
Gardener,	4	–	4
General helper,	1	–	1
Granite works,	1	–	1
Hairdresser,	–	1	1
Hatter,	1	–	1

TABLE 6. — *Occupations of Patients admitted* — Continued.

	Males.	Females.	Totals.
Horse trainer,	1	–	1
Hotel worker,	1	–	1
Housekeeper,	–	10	10
Housewife,	–	64	64
Iceman,	1	–	1
Inspector in library,	1	1	2
Iron and wire worker,	3	–	3
Janitor,	1	–	1
Jeweler,	1	–	1
Journalist,	1	–	1
Junk dealer,	1	–	1
Kitchenmaid,	–	1	1
Labor agent,	1	–	1
Laborer,	35	–	35
Laundress,	–	4	4
Leading rigger,	1	–	1
Leather worker,	5	1	6
Linen worker,	1	–	1
Longshoreman,	1	–	1
Machine operator,	1	1	2
Machinist,	24	–	24
Magician,	1	–	1
Mason,	3	–	3
Metal polisher,	1	–	1
Meter reader,	2	–	2
Mill operative,	9	6	15
Molder,	3	–	3
Motorman,	1	–	1
Mule spinner,	2	–	2
Munition worker,	1	–	1
Nailmaker,	1	–	1
None,	–	2	2
Nurse,	–	4	4
Nursemaid,	–	1	1
Office clerk,	1	2	3
Office work,	–	4	4
Orderly,	2	–	2

TABLE 6. — *Occupations of Patients admitted* — Continued.

	Males.	Females.	Totals.
Packer,	1	–	1
Painter,	4	–	4
Paper hanger,	1	–	1
Pattern maker,	1	–	1
Peddler,	1	–	1
Pharmacist,	1	–	1
Piano maker,	1	–	1
Piano tuner,	1	–	1
Plasterer,	1	–	1
Plumber,	1	–	1
Police officer,	1	–	1
Postman,	2	–	2
Post office clerk,	1	–	1
Poultryman,	1	–	1
Potter,	1	–	1
Printer,	2	–	2
Purser,	1	–	1
Railroad porter,	1	–	1
Real estate dealer,	1	–	1
Restaurant,	1	–	1
Retoucher in studio,	1	–	1
Rubber work,	2	–	2
Saleslady,	–	3	3
Salesman,	2	–	2
Scholar,	2	2	4
Seaman,	3	–	3
Sheet metal,	1	–	1
Shipbuilder,	3	–	3
Shipper,	1	–	1
Shirt waist factory,	–	2	2
Shoe repairer,	1	–	1
Shoe worker,	29	1	30
Sign painter,	1	–	1
Silk cutter,	1	–	1
Singer,	1	–	1
Spinner,	3	1	4
Spring winder,	–	1	1

TABLE 6. — *Occupations of Patients admitted* — Concluded.

	Males.	Females.	Totals.
Steam fitter,	1	–	1
Stenographer,	–	2	2
Steward,	1	–	1
Stitcher,	–	4	4
Stone cutter,	8	–	8
Stove molder,	1	–	1
Straw shop,	1	–	1
Student,	1	3	4
Superintendent, rubber works,	1	–	1
Tailor,	8	–	8
Tailoress,	–	1	1
Tanner,	2	–	2
Teacher,	–	1	1
Teamster,	10	–	10
Telegraph messenger,	2	–	2
Telephone operator,	3	1	4
Tinsmith,	1	–	1
Toolmaker,	1	–	1
Waiter,	7	–	7
Waitress,	–	1	1
Watchman,	1	–	1
Weaver,	10	2	12
Winder tender,	–	1	1
Totals,	351	153	504

TABLE 7. — *Condition on Admission.*

	Males.	Females.	Totals.
Incipient,	2	1	3
Moderately advanced,	187	87	274
Advanced,	145	62	207
Not classified,	15	2	17
Nontuberculous,	–	–	–
Not examined,	2	–	2
Apparently arrested,	–	1	1
Totals,	351	153	504

TABLE 8. — *Condition on Discharge.*

	Males.	Females.	Totals.
Apparently arrested,	9	11	20
Quiescent,	8	8	16
Improved,	142	37	179
Unimproved,	25	34	59
Died,	88	43	131
Not considered,	63	17	80
Nontuberculous,	–	–	–
Totals,	335	150	485

TABLE 9. — *Deaths.*

Duration of Disease.	Males.	Females.	Totals.	Length of Residence at Sanatorium.		
				Males.	Females.	Totals.
Under 1 month,	–	1	1	23	3	26
1 to 2 months,	4	1	5	11	4	15
2 to 3 months,	2	–	2	7	6	13
3 to 4 months,	6	1	7	5	3	8
4 to 5 months,	–	–	–	7	2	9
5 to 6 months,	5	3	8	6	3	9
6 to 7 months,	9	1	10	–	2	2
7 to 8 months,	3	–	3	4	1	5
8 to 9 months,	1	2	3	3	4	7
9 to 10 months,	–	1	1	3	1	4
10 to 11 months,	1	1	2	2	1	3
11 to 12 months,	6	2	8	2	1	3
12 to 18 months,	20	8	28	3	1	4
18 to 24 months,	3	1	4	1	4	5
Over 2 years,	24	16	40	12	6	18
Unknown,	5	4	9	–	–	–
Totals,	89	42	131	89	42	131

TABLE 10. — *Cause of Death.*

	Males.	Females.	Totals.
Phthisis pulmonalis,	88	41	129
Suicide,	1	–	1
Influenza,	–	1	1
Totals,	89	42	131

RUTLAND STATE SANATORIUM.

Resident Officers.

Ernest B. Emerson, M.D.,	*Superintendent.*
Leon A. Alley, M.D.,	*Assistant Superintendent.*
Halbert C. Hubbard, M.D.,	*Physician.*
William B. Davidson, M.D.,	*Physician.*
——— ———,	*Physician.*
——— ———,	*Physician.*
William J. O'Connor, D.M.D.,	*Dentist.*
Delya E. Nardi,	*Superintendent of Nurses.*
Cora A. Phillips,	*Head Matron.*
Walter C. Brown,	*Chief Engineer.*
Joseph A. Carroll,	*Farmer.*

REPORT OF THE SUPERINTENDENT.

To the Commissioner of Public Health.

Dear Sir: — The annual report of the Rutland State Sanatorium for the year ending Nov. 30, 1920, is hereby submitted.

During the year there have been expended $301,330.01 for maintenance and $3,317.51 from the appropriation authorized by chapter 55, Resolves of 1918.

The details of these disbursements are contained in the report of the treasurer.

There were 359 patients in the sanatorium at the beginning of the year and 356 at the close. The largest number present at one time was 372 and the smallest was 311. The daily average number of patients was 345.27. There were 548 cases admitted during the year; 179 incipient, 200 moderately advanced, 150 advanced and 19 unclassified. Including deaths, there were 551 discharged, and the average duration of residence was seven months and twenty-five days. Of those discharged, 362 gained 4,107 pounds, an average gain of 11.35 pounds per person. Including deaths, there were 135 who lost 978 pounds, an average loss of 7.24 pounds per person, and 54 neither gained nor lost. Of the discharges, there were 25 arrested cases, 2 more than last year; 34 apparently arrested, 10 more than last year; 187 quiescent, 37 more than last year; 118 improved and 65 unimproved. There were 45 patients not considered, the duration of treatment being less than one month. There were 62 deaths, 38 more than last year. There were 15 discharged nontuberculous.

The following table shows the classification on the application blank and our classification on admission. The variation in the classification of cases suggests a different method of admission: —

	Classification on Application Blanks.	Our Classification on Admission.
Incipient,	325	179
Moderately advanced,	181	200
Advanced,	22	150
Unclassified,	20	19
Totals,	548	548

At the present time patients are assigned to the sanatorium on the application of the attending physician, and during the past year, with no waiting list or at least a waiting list of only a few days, the disease could not have progressed from incipiency to far advanced between the time of application and admission. In many instances the real condition of the patient has not been indicated on the application blank, and frequently patients indicated on the application blank as suitable for sanatorium treatment have arrived in the last stages and should not have been subjected to the hardship of the journey to Rutland. Some of these patients have passed away within two weeks and 25 per cent of the deaths occurred within four months after arrival. The rule that patients may be transferred or discharged after the thirty-day period of observation, if found unsuitable for sanatorium treatment, is frequently unworkable for the reason that we do not feel that we should subject them to the hardship of travel. Consequently, many beds are filled with incurables while the early and favorable case for treatment is compelled to wait until the disease has progressed beyond the point when anything more than temporary relief can be expected. If the sanatorium is to be conducted for the relief and cure of the greatest number, our facilities should be reserved, I believe, for those patients who have a reasonable chance for improvement at least, and not taken over by those more properly classified in the municipal hospitals. I would suggest that applicants for admission be referred either to one of the consultation clinics or to the sanatorium for final examination before admission. Including the State sanatoria, there are twenty points in the State, and more could be established, where these examinations may be made without involving any great hardship on the part of the patient. It would seem to me that any patient unable to attend one of these clinics would in the majority of cases at least be an unsuitable case for sanatorium treatment and should be sent to the local hospital.

Medical.

Staff meetings have been held once a week, when administrative, medical and other questions have been freely discussed and suggestions offered. These meetings have been of great value not only to the superintendent but also to the assistant physician, to whom a broader perspective of the problem has been presented than that obtained when duties and responsibilities end with ward and clinical work.

Weekly clinics have also been held, when the new cases have been presented by the different members of the staff for examination, diagnosis and classification.

A course of six lectures in early diagnosis and methods of treatment of pulmonary tuberculosis was given at the sanatorium by the medical staff under the auspices of the Wachusett Medical Improvement Society. These exercises were well attended by the physicians of the neighboring towns, and it is proposed to repeat the course the coming year.

Consultation clinics in the diagnosis of pulmonary tuberculosis initiated by the Department of Public Health in September have been conducted in Worces-

ter, Clinton, Gardner and Fitchburg. The response of the profession has been most gratifying and has shown the need for such a point of contact between the sanatorium and the physician in general practice. There have been 92 examinations.

During the year Dr. William J. O'Connor has made 1,452 dental examinations and treatments. The following table shows briefly the scope of this work: —

Prophylactics,	142
Amalgam fillings,	205
Cement fillings,	78
Gutta-percha fillings,	118
Temporary fillings,	142
Pulp treatments,	22
Treatment cases,	301
Surgical dressings,	8
Extractions,	110
Abscess cases,	42
Mouth washes,	44
Vincent's disease,	4
Inlays,	68
Repairs to plates,	12
Bridges,	54
Plates,	14
Crowns,	67
X-rays,	78
Repairs to bridges,	4

Dr. Mary E. Gaffney resigned under date of Sept. 15, 1920, to accept the superintendency of the Woman's Hospital in Philadelphia. Dr. David E. Mann resigned Oct. 15, 1920, to accept a position at the National Sanatorium, Johnson City, Tenn. The resignations of Dr. Gaffney and Dr. Mann are much regretted. Both had rendered good service, and with their knowledge of tuberculosis the call to broader fields is distinctly our loss. Neither of these vacancies has been filled.

Miss Delya E. Nardi continues in charge of the training school for nurses.

In order to maintain the standard of nursing required by the State Board of Registration of Nurses the training school has been affiliated with that of the Milford Hospital. There are 8 probationers, 6 juniors and 8 seniors now in training.

The following have been awarded diplomas: Jane L. Cross, Mary Belz, Mary E. O'Brien, Helen Trombley, Freida Katz, Mary E. Moore, Alice B. McDonald and Alice Tucker.

Entertainments and diversion so far as compatible with the physical condition of our patients have been provided throughout the year. A Camera Club, Debating Society and a Garden Club were organized and afforded much entertainment, and, in some instances, a considerable degree of profit for the members. The Garden Club was organized rather late in the spring on account of the unsettled conditions on the farm. The plowing and other heavy work necessary to prepare the land for garden crops was done by the regular farm force. This land was then turned over to the Garden Club, with seeds, tools and overalls, and left to the management and direction of the patients them-

selves with no supervision whatever other than medical. The results more than justified the experiment by the amount of produce raised, the season's supply of fresh vegetables, and by the improved physical condition of the patients taking part in this work.

Numerous talks and demonstrations have been given to the patients on health subjects, particularly those relating to tuberculosis, by members of the staff. These talks have been universally attended and we believe that, as a result of them, there has been better co-operation between patients, physicians and nurses.

Entertainments have been provided by members of the household, the Red Cross, the Knights of Columbus, Community Service and players from the Polis Theatre of Worcester.

Farm.

Charles E. Chapman, head farmer, resigned May 19, 1920, and Joseph A. Carroll was appointed to that position May 25, 1920.

Recommendations.

Plans and specifications have been submitted for a building to provide quarters for 42 employees now located in dormitories adjacent to the wards and using toilets, lavatories and locker rooms in common with the patients. Non-tuberculous employees will not submit to these conditions, and the ex-patient who has become an employee is entitled to the privacy of his own room. Furthermore, the overcrowding results in more or less friction between patients and employees. The removal of these employees to a separate building will increase the capacity of the institution without proportionately increasing the number of workers. The dormitories now occupied by employees would afford space for reading and recreation rooms. At the present time there is no place, with the exception of the toilets and lavatories, where patients may congregate in the evening or go during the day where heat is provided. The lack of such facilities is a hardship particularly during the winter months. It is estimated that the building described in the specifications can be erected at the present time for $96,000.

I recommend that $10,000 be appropriated for the installation of steel lockers to replace the present wooden lockers, which are obsolete and unsanitary. Also that $4,000 be appropriated for the erection of a garage. Attention has been called to the condition of our roofs in a previous report and I recommend an appropriation of $16,000 for repairs and renewals be included in the estimate for maintenance for the ensuing year.

In closing, I wish to acknowledge the loyalty and fidelity of the members of the household who have made it possible to carry through the work of the year. I am furthermore obligated to you for your courtesy and many suggestions which have gone far in improving our service.

Respectfully,

Ernest B. Emerson,
Superintendent.

TREASURER'S REPORT.

To the Commissioner of Public Health.

I respectfully submit the following report of the finances of this institution for the fiscal year ending Nov. 30, 1920: —

Cash Account.

Balance Dec. 1, 1919,				$1,128 94
Receipts.				
Institution Receipts.				
Board of inmates: —				
Private,		$8,556 32		
Cities and towns,		40,103 91		
Reimbursements, charitable, State minor wards,		52 00		
			$48,712 23	
Sales: —				
Furnishings and household supplies,		$28 65		
Medical and general care,		282 46		
Farm and stable: —				
Cows and calves,	$316 00 [1]			
Hides,	31 61			
Ice,	7 72			
Sundries,	108 64			
		463 97		
Repairs, ordinary,		55 79		
			830 87	
Miscellaneous receipts: —				
Interest on bank balances,		$432 78		
Sundries,		193 29		
			626 07	
				50,169 17
Receipts from Treasury of Commonwealth.				
Maintenance appropriations: —				
Balance of 1919,			$19,065 29	
Supplementary schedule,			3,504 33	
Advance money (amount on hand November 30),			20,000 00	
Approved schedules of 1920,			267,735 26	
				310,304 88
Special appropriations,				3,317 51
Total,				$364,920 50

Payments.

To the treasury of Commonwealth, institution receipts,			$50,169 17
Maintenance appropriations: —			
Supplementary November schedule,	$3,504 33		
Balance November schedule, 1919,	20,194 23		
Eleven months' schedules, 1920,	267,735 26		
November advances,	8,513 81		
			299,947 63
Amount carried forward,			$350,116 80

[1] Adjustment entry, March 4, 1920, treated as income, current year, by Auditor instead of refund, account of previous year's business.

Amount brought forward,		$350,116 80
Special appropriations: —		
Approved schedules,		3,317 51
Balance Nov. 30, 1920: —		
In bank,	$7,578 16	
In office,	3,908 03	
		11,486 19
Total,		$364,920 50

MAINTENANCE.

Balance from previous year, brought forward,		$3,722 33
Appropriation, current year,		304,280 00
Total,		$308,002 33
Expenses (as analyzed below),		301,330 01
Balance reverting to treasury of Commonwealth,		$6,672 32

Analysis of Expenses.

Personal services: —		
Ernest B. Emerson, M.D., superintendent,	$3,546 77	
Medical,	8,443 52	
Administration,	8,161 82	
Kitchen and dining-room service,	20,441 25	
Domestic,	15,548 99	
Ward service (male),	9,886 01	
Ward service (female),	14,500 29	
Engineering department,	12,960 74	
Repairs,	4,907 02	
Farm,	11,099 01	
Stable, garage and grounds,	5,612 48	
		$115,107 90
Religious instruction: —		
Catholic,	$600 00	
Hebrew,	600 00	
Protestant,	600 00	
		1,800 00
Travel, transportation and office expenses: —		
Advertising,	$6 40	
Postage,	255 00	
Printing and binding,	467 56	
Stationery and office supplies,	683 42	
Telephone and telegraph,	1,228 62	
Travel,	517 08	
Sundries,	12 25	
Freight,	14 01	
		3,184 34
Amount carried forward,		$120,092 24

Amount brought forward,		$120,092 24
Food: —		
Flour,	$4,268 64	
Cereals, rice, meal, etc.,	1,783 62	
Bread, crackers, etc.,	212 22	
Peas and beans (canned and dried),	1,261 92	
Macaroni and spaghetti,	134 97	
Potatoes,	3,572 29	
Meat,	30,667 71	
Fish (fresh, cured and canned),	2,393 26	
Butter,	9,722 95	
Butterine, etc.,	56 70	
Cheese,	164 77	
Coffee,	1,449 60	
Tea,	228 10	
Cocoa,	80 68	
Whole milk,	15,132 90	
Milk (condensed, evaporated, etc.),	165 33	
Eggs (fresh),	7,621 82	
Sugar (cane),	4,377 34	
Fruit (fresh),	1,035 39	
Fruit (dried and preserved),	3,407 92	
Lard and substitutes,	35 00	
Molasses and syrups,	637 08	
Vegetables (fresh),	828 96	
Vegetables (canned and dried),	1,470 31	
Seasonings and condiments,	1,242 11	
Yeast, baking powder, etc.,	158 79	
Sundry foods,	6 39	
Freight,	1,082 57	
		93,199 34
Clothing and materials: —		
Clothing (outer),	$215 31	
Dry goods for clothing,	24 33	
		239 64
Furnishings and household supplies: —		
Beds, bedding, etc.,	$2,689 36	
Carpets, rugs, etc.,	8 10	
Crockery, glassware, cutlery, etc.,	1,250 02	
Dry goods and smallwares,	150 02	
Electric lamps,	700 57	
Fire hose and extinguishers,	741 32	
Furniture, upholstery, etc.,	340 41	
Kitchen and household wares,	2,053 12	
Laundry supplies and materials,	468 53	
Lavatory supplies and disinfectants,	1,253 98	
Table linen, paper napkins, towels, etc.,	692 86	
Freight,	107 39	
		10,455 68
Medical and general care: —		
Books, periodicals, etc.,	$196 83	
Entertainments, games, etc.,	354 39	
Funeral expenses,	50 00	
Amounts carried forward,	$601 22	$223,986 90

Amounts brought forward,	$601 22	$223,986 90
Medical and general care — *Con.*		
Gratuities,	23 03	
Ice and refrigeration,	279 82	
Laboratory supplies and apparatus,	605 07	
Medicines (supplies and apparatus),	2,623 89	
Medical attendance (extra),	100 00	
Sputum cups, etc.,	975 87	
Tobacco, pipes, matches,	12 75	
Water,	3,492 93	
Freight,	73 31	
		8,787 89
Heat, light and power: —		
Coal (bituminous),	$18,386 58	
Freight and cartage,	10,466 84	
Coal (anthracite),	344 23	
Freight and cartage,	157 76	
Charcoal,	50 00	
Electricity,	120 00	
Oil,	884 71	
Operating supplies for boilers and engines,	307 02	
Sundries,	7 22	
Freight,	9 86	
		30,734 22
Farm: —		
Bedding materials,	$379 81	
Blacksmithing and supplies,	204 34	
Carriages, wagons and repairs,	14 70	
Dairy equipment and supplies,	42 16	
Fencing materials,	141 11	
Fertilizers,	1,513 63	
Grain, etc.,	11,758 46	
Harnesses and repairs,	340 42	
Horses,	600 00	
Cows,	2,025 00	
Other live stock,	479 00	
Labor (not on pay roll),	209 25	
Spraying materials,	87 20	
Stable and barn supplies,	107 06	
Tools, implements, machines, etc.,	997 12	
Trees, vines, seeds, etc.,	913 62	
Veterinary services, supplies, etc.,	314 73	
Sundries,	13 00	
Freight,	279 24	
		20,419 85
Garage, stable and grounds: —		
Motor vehicles,	$3,555 99	
Automobile repairs and supplies,	2,849 64	
Bedding and materials,	45 92	
Blacksmithing and supplies,	179 45	
Amounts carried forward,	$6,631 00	$283,928 86

Amounts brought forward,	$6,631 00	$283,928 86
Garage, stable and grounds — *Con.*		
Carriages, wagons and repairs,	6 50	
Grain,	393 33	
Harnesses and repairs,	49 00	
Spraying materials,	13 75	
Stable supplies,	30 38	
Tools, implements, machines, etc.,	44 08	
Trees, vines, seeds, etc.,	13 29	
Freight,	25	
		7,181 58
Repairs, ordinary: —		
Cement, lime, crushed stone, etc.,	$395 04	
Electrical work and supplies,	299 72	
Hardware, iron, steel, etc.,	446 61	
Labor (not on pay roll),	2,589 07	
Lumber, etc. (including finished products),	789 86	
Paint, oil, glass, etc.,	1,248 84	
Plumbing and supplies,	633 82	
Roofing and materials,	447 80	
Steam fittings and supplies,	530 58	
Tools, machines, etc.,	663 23	
Boilers, repairs,	506 59	
Dynamos, repairs,	361 91	
Engines, repairs,	121 37	
Freight,	94 65	
		9,129 09
Repairs and renewals: —		
Boiler repairs, 1919,	$679 97	
Linoleum,	406 24	
Freight on scales,	4 27	
		1,090 48
Total expenses for maintenance,		$301,330 01

SPECIAL APPROPRIATIONS.

Balance Dec. 1, 1919,	$4,411 77
Appropriations for current year,	—
Total,	$4,411 77
Expended during the year (see statement below),	3,317 51
Balance Nov. 30, 1920, carried to next year,	$1,094 26

OBJECT.	Act or Resolve.	Whole Amount.	Expended during Fiscal year.	Total Expended to Date.	Balance at End of Year.
Kitchen, service and storehouse buildings,	Chap. 55, 1918,	$55,000 00	$3,317 51	$53,905 74	$1,094 26
		$55,000 00	$3,317 51	$53,905 74	$1,094 26

Resources and Liabilities.

Resources.

Cash on hand,	$11,486 19	
November cash vouchers (paid from advance money), account of maintenance,	8,513 81	
		$20,000 00
Due from treasury of Commonwealth from available appropriation, account of November, 1920, schedule,		10,090 42
		$30,090 42

Liabilities.

Schedule of November bills, including supplementary November, 1919, schedule of $218,	$30,090 42

Per Capita.

During the year the average number of inmates has been 345.27.
Total cost for maintenance, $301,330.01.
Equal to a weekly per capita cost of $16.7834.
Receipt from sales, $830.87.
Equal to a weekly per capita of $0.04627.
All other institution receipts, $49,338.30.
Equal to a weekly per capita of $2.7480.

Respectfully submitted,

Leon A. Alley,
Treasurer.

Examined and found correct as compared with the records in the office of the Auditor of the Commonwealth.

Alonzo B. Cook,
Auditor.

VALUATION.

Land.

Grounds (42.147 acres),	$17,945 80		
Lawns and buildings, 32.147 acres.			
Roads, 10 acres.			
Woodland (77.71 acres),	2,683 65		
Mowing (84.74 acres),	8,474 00		
Tillage (46.26 acres),	4,670 25		
Tillage, 37.16 acres.			
Garden, 9.10 acres.			
Orchard (1.64 acres),	328 00		
Pasture (76.58 acres),	1,182 60		
Waste and miscellaneous (35.65 acres),	1,671 90		
Rough pasture, 10.95 acres.			
Meadow swamp land, 18.22 acres.			
Sewer beds, 5.98 acres.			
New coal trestle, .50 acres.			
		$36,956 20	
Sewerage system,		15,508 32	
			$52,464 52
Amount carried forward,			$52,464 52

Amount brought forward,		$52,464 52
Buildings.		
Institution buildings,	$482,885 44	
Farm, stable and grounds,	25,175 00	
Miscellaneous,	29,536 25	
		537,596 69
Total,		$590,061 21
Present value of all personal property as per inventory of Dec. 1, 1920,		106,152 59
Grand total,		$696,213 80

SPECIAL REPORT.

The following report is prepared in accordance with a resolution of the National Conference on Charities and Corrections, adopted May 15, 1906: —

Population.

	Males.	Females.	Totals.
Number received during the year,	325	223	548
Number passing out of the institution during the year,	334	217	551
Number at end of fiscal year in the institution,	182	174	356
Daily average attendance (*i.e.*, number of inmates actually present during the year).	180.53	164.74	345.27
Average number of employees and officers during the year,	119.60	52.68	172.28

Expenditures.

Current expenditures: —		
1. Salaries and wages,	$115,107 90	
2. Clothing,	239 64	
3. Subsistence,	93,199 34	
4. Ordinary repairs,	9,129 09	
5. Office, domestic and outdoor expenses,	82,563 56	
Total,		$300,239 53
Extraordinary expenses: —		
1. Permanent improvements to existing buildings,		1,090 48
		$301,330 01

Summary of Current Expenses.

Total expenditures,	$301,330 01
Deducting extraordinary expenses,	1,090 48
	$300,239 53
Deducting amount of sales,	630 87
Total,	$299,608 66

Dividing this amount by the daily average number of patients — 345.27 — gives a cost for the year of $864.884, equivalent to an average weekly net cost of $16.63.

STATISTICAL TABLES.

TABLE 1. — *Admissions and Discharges.*

	Males.	Females.	Totals.
Number of patients in sanatorium Nov. 30, 1920,	193	166	359
Number admitted Dec. 1, 1919, to Nov. 30, 1920,	325	223	548
Number discharged Dec. 1, 1919, to Nov. 30, 1920,	334	217	551
Number remaining in sanatorium Nov. 30, 1920,	182	174	356
Daily average number of patients,	180.53	164.74	345.27
Died (included in number discharged),	32	30	62

TABLE 2. — *Civil Condition of Patients admitted.*

	Males.	Females.	Totals.
Single,	161	112	273
Married,	152	97	249
Widowed,	10	14	24
Divorced,	2	–	2
Totals,	325	223	548

TABLE 3. — *Age of Patients admitted.*

	Males.	Females.	Totals.
Under 14 years,	–	1	1
14 to 20 years,	37	41	78
20 to 30 years,	164	110	274
30 to 40 years,	84	52	136
40 to 50 years,	36	17	53
Over 50 years,	4	2	6
Totals,	325	223	548

TABLE 4. — *Nativity and Parentage of Patients admitted.*

PLACES OF NATIVITY.	MALES.			FEMALES.			TOTALS.		
	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.
United States: —									
Massachusetts, . .	151	55	61	110	33	30	261	88	91
Other New England States,	25	24	20	15	12	14	40	36	34
Other States, . . .	15	16	14	11	11	8	26	27	22
Total native, . .	191	95	95	136	56	52	327	151	147
Other countries (25), .	134	225	223	87	163	169	221	388	392
Unknown, . . .	–	5	7	–	4	2	–	9	9
Grand totals, . .	325	325	325	223	223	223	548	548	548

TABLE 5. — *Residence of Patients admitted.*

PLACE.	Number.	PLACE.	Number.
Boston, ...	200	Salem, ...	9
Cambridge, ...	16	Somerville, ...	9
Chelsea, ...	10	Springfield, ...	12
Lawrence, ...	13	Worcester, ...	61
Lowell, ...	10	Other cities and towns (85), . .	197
Lynn, ...	11	Total, ...	548

TABLE 6. — *Occupations of Patients admitted.*

	Males.	Females.	Totals.
Accountant, ...	1	–	1
Attendant, ...	3	1	4
Baker, ...	1	–	1
Barber, ...	7	–	7
Bartender, ...	1	–	1
Blacksmith, ...	2	–	2
Bookkeeper, ...	2	4	6
Box nailer, ...	1	–	1
Brakeman, ...	1	–	1

TABLE 6. — *Occupations of Patients admitted* — Continued.

	Males.	Females.	Totals.
Bridgeman,	1	–	1
Carpenter,	6	–	6
Cashier,	1	1	2
Chauffeur,	8	–	8
Cigarmaker,	1	–	1
Clerk,	25	20	45
Colorist,	–	1	1
Conductor,	3	–	3
Cook,	6	–	6
Corsetière,	–	1	1
Cutter, clothing,	2	–	2
Cutter, meat,	2	–	2
Cutter, shoe,	1	–	1
Cutter, stone,	1	–	1
Dentist,	1	–	1
Designer, machine,	1	–	1
Dishwasher,	1	–	1
Draftsman,	2	–	2
Dressmaker,	–	3	3
Dyer,	1	–	1
Electrician,	3	–	3
Engineer,	2	–	2
Engineer, civil,	1	–	1
Factory,	54	29	83
Fireman,	3	–	3
Florist,	1	–	1
Foreman, section,	1	–	1
Foundry,	1	–	1
Garage man,	1	–	1
General work,	13	4	17
Glassblower,	1	–	1
Guard,	1	–	1
Hairdresser,	–	1	1
Hatter,	1	–	1
Housewife,	–	74	74
Housework,	–	27	27
Iceman,	2	–	2

TABLE 6. — *Occupations of Patients admitted* — Continued.

	Males.	Females.	Totals.
Insurance agent,	1	–	1
Ironworker,	2	–	2
Janitor,	2	–	2
Junkdealer,	1	–	1
Laborer,	18	–	18
Laundress,	–	2	2
Letter carrier,	1	–	1
Lineman,	3	–	3
Lodging-house keeper,	–	1	1
Longshoreman,	2	–	2
Machinist,	25	–	25
Manager, assistant,	1	–	1
Manager, hotel,	1	–	1
Manager, store,	1	–	1
Marine,	1	–	1
Mechanic,	2	–	2
Merchant,	1	–	1
Messenger,	–	1	1
Metal worker,	3	–	3
Milliner,	–	3	3
Molder,	1	–	1
Needlework,	–	1	1
No work,	3	12	15
Nurse, student,	1	3	4
Nurse, trained,	2	6	8
Nursemaid,	–	7	7
Oiler, ship,	1	–	1
Optician,	1	–	1
Orderly,	2	–	2
Painter,	2	–	2
Pharmacist,	1	–	1
Plumber,	3	–	3
Presser, clothes,	1	–	1
Pressman,	1	1	2
Printer,	4	–	4
Printer, wallpaper,	1	–	1
Proprietor, bowling alley,	1	–	1

TABLE 6. — *Occupations of Patients admitted* — Concluded.

	Males.	Females.	Totals.
Publisher, music,	1	–	1
Real estate,	1	–	1
Repairer, auto,	1	–	1
Repairer, engine,	2	–	2
Repairer, shoe,	3	–	3
Roofer,	1	–	1
Sailor,	1	–	1
Salesman,	12	2	14
Ship builder,	5	–	5
Shipper,	2	–	2
Sign writer,	1	–	1
Soldier,	4	–	4
Steam fitter,	3	–	3
Stenographer,	1	2	3
Student,	9	4	13
Tailor,	4	–	4
Teacher, school,	–	2	2
Teamster,	4	–	4
Telephone operator,	–	6	6
Upholsterer,	1	–	1
Waiter,	3	4	7
Wireworker,	9	–	9
Totals,	325	223	548

TABLE 7. — *Condition on Admission.*

	Males.	Females.	Totals.	Per Cent.
Incipient,	113	66	179	32.66
Moderately advanced,	120	80	200	36.50
Far advanced,	79	71	150	27.37
Unclassified,	13	6	19	3.47
Totals,	325	223	548	100.00

TABLE 8. — *Condition on Discharge.*

	Males.	Females.	Totals.
Arrested,	12	13	25
Apparently arrested,	18	16	34
Quiescent,	120	67	187
Improved,	84	34	118
Unimproved,	27	38	65
Died,	32	30	62
Nontuberculous,	13	2	15
Not considered,	28	17	45
Totals,	334	217	551

TABLE 9. — *Deaths.*

Duration of Disease.	Males.	Females.	Totals.	Length of Residence at Sanatorium.		
				Males.	Females.	Totals.
Under 1 month,	–	–	–	–	3	3
1 to 2 months,	–	–	–	2	–	2
2 to 3 months,	–	–	–	2	2	4
3 to 4 months,	–	–	–	3	2	5
4 to 5 months,	–	–	–	2	3	5
5 to 6 months,	–	–	–	4	3	7
6 to 7 months,	–	–	–	3	5	8
7 to 8 months,	–	–	–	3	2	5
8 to 9 months,	–	–	–	2	1	3
9 to 10 months,	–	–	–	4	1	5
10 to 11 months,	–	–	–	2	–	2
11 to 12 months,	2	2	4	2	2	4
12 to 18 months,	4	5	9	2	4	6
18 to 24 months,	3	5	8	1	1	2
Over 2 years,	8	5	13	–	1	1
Unknown,	15	13	28	–	–	–
Totals,	32	30	62	32	30	62

TABLE 10. — *Cause of Death.*

	Males.	Females.	Totals.
Phthisis pulmonalis,	32	30	62
Totals,	32	30	62

Report of State Examiners of Plumbers

James C. Coffey, *Chairman*

Report of State Examiners of Plumbers.

Information concerning Examinations for Plumbers, showing the Place and Date of Examination and Number examined, together with the Results of the Examinations, etc.

Examinations.	Examined.	Passed.	Refused.
Boston, Dec. 6, 1919,	90	12	78
Lowell, Dec. 20, 1919,	18	5	13
Boston, Jan. 3, 1920,	70	15	55
Pittsfield, Jan. 17, 1920,	17	1	16
Boston, Feb. 7, 1920,	70	8	62
Springfield, Feb. 21, 1920,	40	5	35
Boston, Mar. 6, 1920,	101	11	90
Fall River, Mar. 20, 1920,	32	4	28
Boston, Apr. 3, 1920,	86	13	73
Worcester, Apr. 17, 1920,	51	7	44
Boston, May 1, 1920,	96	20	76
Lowell, May 15, 1920,	34	7	27
Boston, June 5, 1920,	96	17	79
Pittsfield, June 19, 1920,	17	6	11
Boston, July 3, 1920,	93	23	70
Boston, Sept. 4, 1920,	93	17	76
Springfield, Sept. 18, 1920,	26	5	21
Boston, Oct. 2, 1920,	91	12	79
Fall River, Oct. 16, 1920,	14	3	11
Boston, Nov. 6, 1920,	55	6	49
Worcester, Nov. 20, 1920,	38	4	34
Totals,	1,227	201	1,026

	Masters.	Journeymen.	Total.
Licenses granted on account of examination, Dec. 1, 1919, to Dec. 1, 1920.	77	123	200
Probationary licenses issued during year,	–	6	–

Registrations.	Masters.	Journeymen.
December, 1919,	1	1
January, 1920,	1	2
February, 1920,	1	1
March, 1920,	–	1
May, 1920,	4	2
June, 1920,	3	1
July, 1920,	1	2
August, 1920,	–	–
September, 1920,	1	–
October, 1920,	1	–
November, 1920,	2	3
Totals,	16	14

Meetings,	54	Examinations,	21

Fees received.	Paid to the Treasurer of the Commonwealth.
1,227 examination fees, at $0.50,	$613 50
97 master plumber licenses issued, at $2,	194 00
148 journeymen plumber licenses issued, at $0.50,	74 00
1,803 master plumber renewals issued, at $0.50,	901 50
4,247 journeymen plumber renewals, at $0.50,	2,123 50
Back fees, at $0.50,	167 00
Total,	$4,073 50
Interest during May, 1920,	1 74
	$4,075 24

For carrying out the Provisions of the Act relative to the Examination of Plumbers.

Salaries,	$3,068 06
Examiners' wages,	460 00
Traveling,	510 94
Express,	34 97
Printing,	349 56
Postage.	79 44
Books, stationery and typewriting supplies,	42 32
Plumbers' materials,	30 25
Extra services,	105 15
Cleaning,	17 00
Office supplies,	19 77
Telephone and lighting,	106 16
Miscellaneous,	8 25
Total,	$4,831 87
Unexpended balance,	7 99
	$4,839 86

Summary of Registration.

	Masters.	Journeymen.
Certificate holders (individuals),	462 [1]	461
Licenses, year ending May 1, 1920 (individuals),	1,821 [2]	2,966
	2,283	3,427

[1] Holding journeymen also, 311. [2] Holding journeymen also, 1,593.

Number of last master license issued up to Aug. 1, 1920,	2,845
Number of last journeyman license issued up to Aug. 1, 1920,	6,573

Deceased Plumbers reported to Examiners.

Masters,	7	Journeymen,	4

Papers written in 1920 and Pamphlets issued

Papers written in 1920 and Pamphlets issued.

Papers written by Members of the State Department of Public Health during the Year 1920.

Division of Administration.

Eugene R. Kelley, M.D., Commissioner of Public Health.

"The Development of Nutrition Activities by the Massachusetts Department of Public Health." The Commonhealth, Vol. 7, No. 4, July–August, 1920.

"The Development of Mouth Hygiene Activities in the Department of Public Health." The Commonhealth, Vol. 7, No. 5, September–October, 1920.

"The Control and Prevention of Bubonic Plague." Current Events, Boston Chamber of Commerce, November, 1920.

"Some General Considerations Relative to the Tuberculosis Problem." Annual Report, Massachusetts Tuberculosis League, Vol. II, No. 5, June, 1920.

Division of Sanitary Engineering.

Mr. X. H. Goodnough.

"Boating and Fishing in Ponds and Reservoirs used as Sources of Water Supply." Journal of the New England Water Works Association, Vol. XXXIV, No. 3, 1920.

Mr. Arthur D. Weston.

"Epidemic of Gastro-Enteritis in Peabody, Mass., October, 1913." Journal of the New England Water Works Association, Vol. XXXIV, No. 3, 1920.

Division of Communicable Diseases.

Stanley H. Osborn, M.D.

"Health Dividends You Have Drawn." Boston Medical and Surgical Journal, May 13, 1920; also in The Commonhealth, Vol. 7, No. 2, March–April, 1920.

"Influenza in Massachusetts." The Commonhealth, Vol. 7, No. 3, May–June, 1920.

"Anthrax Problem in Massachusetts." American Journal of Public Health, August, 1920.

Stanley H. Osborn, M.D., and Edith A. Beckler, S.B.

"Once a Typhoid Carrier Always a Typhoid Carrier." The Journal of Infectious Diseases, August, 1920.

Louis L. Williams, Jr., M.D.

"The Carrier in an Outbreak of Diphtheria." The Commonhealth, Vol. 7, No. 2, March–April, 1920.

Mary R. Lakeman, M.D.

"Study Groups. A Feature of the Program of the Sub-Division of Venereal Diseases, Massachusetts Department of Public Health." Journal of Social Hygiene, Vol. VI, No. 4, October, 1920.

George T. O'Donnell, M.D.

"Causes of Typhoid Fever in Massachusetts." American Journal of Public Health, June, 1920.

Francis A. Finnegan, M.D.

"Institutional Control of Diphtheria." Boston Medical and Surgical Journal, Jan. 22, 1920.

Division of Hygiene.

Merrill E. Champion, M.D.

"School Hygiene." The Commonhealth, Vol. 7, No. 3, May–June, 1920.

"A Nutritional Program for Massachusetts." The Commonhealth, Vol. 7, No. 4, July–August, 1920.

Mary Putnam, M.D.

"A Survey of Rural Children in Western Massachusetts." The Commonhealth, Vol. 7, No. 6, November–December, 1920.

Edwin N. Kent, D.M.D.

"Mouth Hygiene and Public Health." The Commonhealth, Vol. 7, No. 5, September–October, 1920.

Hazel Wedgwood, R.N.

"Child Welfare." The Commonhealth, Vol. 7, No. 3, May–June, 1920.

Alzira Wentworth Sandwall, S.B.

"The School Lunch." The Commonhealth, Vol. 7, No. 1, January–February, 1920.

"How Cooking Affects the Digestibility of Foods." The Commonhealth, Vol. 7, No. 2, March–April, 1920.

"Nutrition Activities in Massachusetts." The Commonhealth, Vol. 7, No. 4, July–August, 1920.

Evelyn C. Schmidt, D.H.

"What is an Oral Hygienist?" The Commonhealth, Vol. 7, No. 5, September–October, 1920.

Division of Water and Sewage Laboratories.

Mr. H. W. Clark.

"Bacillus Coli and Bacillus Aërogenes." The Commonhealth, Vol. 7, No. 3, May–June, 1920.

"A Study of Massachusetts Water Supplies and the Typhoid Rate." Journal of the New England Water Works Association, Vol. XXXIV, No. 3, 1920.

Division of Biologic Laboratories.

William A. Hinton, M.D.

"A Standardized Method of Performing the Wassermann Reaction." American Journal of Syphilis, Vol. IV, October, 1920.

Division of Tuberculosis.

William J. Gallivan, M.D.

"A Plea for a Department of Tuberculosis in Medical Schools." Boston Medical and Surgical Journal, Vol. 183, p. 348, Sept. 16, 1920.

Pamphlets issued by the State Department of Public Health.

A Health Creed for Massachusetts Boys and Girls.
Cancer: Facts which every Adult should know.
Carbohydrate Foods.
Constipation.
Diet No. 1. The Breast-fed Baby.
Diet No. 2. The Bottle-fed Baby.
Diet No. 3. Diet for Child from Ten Months to Eighteen Months.
Diet No. 4. Diet for Child from Eighteen Months to Two Years.
Diet for the Mother.
Diphtheria Bulletin.
Do you know that —
Encephalitis Lethargica.
Fly Danger.
Food for Children from Two to Six Years Old.
Food for the Child.
Foodways to Health.
Food: What it is and what it does.
Health Habits.
Height and Weight Tables: Adults.
How Cooking affects the Digestibility of Foods.
Infantile Paralysis: Committee Report, State and Provincial Boards of Health.
Infantile Paralysis in Massachusetts in 1909.
Infantile Paralysis in Massachusetts, 1907–12.
Influenza Bulletin.
Lime Water as a Mouth Wash.
List of Illustrated Lectures and Moving Pictures on Public Health Work.
Mosquitoes and Malaria.
Posture and its Relation to Health.
Simple Facts about Digestion.
The Abatement of Nuisances.
The A B C of Eating.
The Baby and You.

The Control of Ophthalmia Neonatorum.
The Food of Working Women in Boston.
The Home Care of the Mouth.
The Importance of Minerals in the Diet.
The Importance of Mouth Cleanliness.
The Occurrence of Infantile Paralysis in Massachusetts in 1908.
The Venereal Diseases.
The 1916 Epidemic of Poliomyelitis.
Tissue-forming Foods.
Vitamines or Accessory Food Factors.

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